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STEPHENSON, D.

11. The following is a list of the names of the students who have been admitted to the college during the year 1871-72. The names are arranged in alphabetical order.

AMHERST COLLEGE

The following is a list of the names of the students who have been admitted to the college during the year 1871-72. The names are arranged in alphabetical order.

Advertisement.

HAVING obtain'd his Majesty's Letters Patent for some new Inventions and Improvements relating to Mechanicks, Hydraulicks, Navigation, Magneticks, &c. A summary Account and Abstract whereof is contain'd in the following Propositions; if any Persons desire farther Information thereupon, or are willing to join in carrying the same into Execution, upon applying to the Author DAV. STEPHENSON, they may receive full Satisfaction, he having prepared proper Draughts and Models for demonstrating the Truth thereof.

M E C H A N I C K S.

1. Proposition, contains a new Method, whereby Motion, Power and Force may be produced, either with solid or fluid Bodies, in a much greater Quantity, than can be done by any other Methods which human Art can invent. And how the Power and Force thus produced, may be applied for communicating Motion to all Sorts of Machines, either for raising Water, or overcoming any other Resistance how great soever. The Solution of this capital Problem, which virtually comprehends the whole of practical Mechanicks, is demonstrated by proper Draughts and Models thereunto relating.

2. Proposition, exhibits a new Method for putting either great, solid or fluid Bodies into a circular Motion, whereby a great Power may be produced from the centrifugal projectile Force, which the said Bodies will acquire upon becoming subject to this particular Law of Motion. And in what Manner the centrifugal Force thus produced, may be applied for working all Sorts of Engines; as is demonstrated by Draughts and Models.

3. Proposition, proposes a new Method for diminishing Friction in Engines, by the Interposition and Pressure of Fluids apply'd to such Parts of the Engine, wherein the greatest Friction and Resistance to its Motion consists; as is demonstrated by Draughts and Models.

4. Proposition, proposes a new Method for collecting and applying the Force of Men, in a much greater Quantity, and more commodious Manner, (in such wise that one Man shall be equivalent to two the common Way) either for working the Capstane, Windlass, Crane, &c. whereby those mechanical Organs and Engines will be rendered of more general Use; as is shewn by Draughts and Models.

5. Proposition, contains divers new Methods for collecting and applying the Force of running Water, in a much greater Quantity, and more advantageous Manner, for communicating Motion to all Sorts of Engines. In the Solution of this capital Problem, sundry new Machines are described, which may be applied either for raising Water, or producing any other Effects whatever, which Machines may be erected and worked upon all Parts of Rivers, Currents, Inlets, and Arms of the Sea; where no other Engines can be erected or work'd for want of a sufficient Fall, Force and Current in the Water, which Machines having this Property of being erected and worked upon all Rivers, Currents, &c. where no other Engines can be erected or worked, will prove of universal infinite Use for the Improvement of all commercial mechanical Arts, Trades, with the Manufactures of all Commodities; as is shewn by Draughts and Models.

6. Proposition, proposes some new Methods for collecting and applying the Force of the Wind, in a greater Quantity, and more commodious Manner for communicating Motion to Engines, whereby they will be of more general Use; as is shewn by Draughts and Models.

7. Proposition, proposes a new Method for constructing the Pyrometer, for measuring the Fluxionary Increments and Decrements produced in the Dimensions of Bodies by the different Degrees of Heat apply'd thereto; with its Use and Application for measuring the true Lengthening and shortning of the Pendulums of Clocks, and how to correct the Irregularities produced therefrom, whereby they will become fitted for measuring Time more equably, both by Land and Sea. The Use of this Instrument is farther exemplified, for settling a permanent immutable Standard-Measure for the Lengths, Capacities, and Weights of Bodies, which are all yet wanting; as is demonstrated by Draughts.

8. Proposition relates to a new Method for constructing the Barometer, Thermometer, and Hygrometer, with the Description of a new Instrument for drawing Objects in Perspective, upon all Sorts of Plains, &c. as is demonstrated by Draughts and Models, &c.

H Y D R A U L I C K S.

1. Proposition, proposes two new Methods for raising Water, the first is through streight open Pipes inclined to the Horizon, in an Angle between ten and twenty Degrees. The second Method is through spiral vertical Pipes. In both which Methods no Use is made of any Valves, Forcers or Pistons, &c. grounded on the Laws and Principles of the centrifugal Force. By this Method Water may be rais'd in very great Quantities to small or moderate Heights, which will render it greatly

greatly preferable to any other, for draining and recovering such Lands as are overflowed and rendered Waste by Inundation ; as is demonstrated by Draughts and Models.

2. Proposition, proposes divers new Engines for raising Water in great Quantities, and to any Heights, with less Expence of Time and Power, than any heretofore invented ; which Engines may be work'd by any of the common auxiliary Powers, as Men, Horses, Wind, Water, Fire, &c. besides the new general Powers propos'd in the two first Propositions in Mechanicks. These hydraulick Engines have one Property, besides many others, whereby they are essentially differenced from all others, namely, that the Forcers operate upon the Water, with a continued circular Motion and Stroke, without Intermission or Reversion, whereby the Water is kept flowing in a constant uniform Stream in the Force-Pipes, without the Use of any Valves, which are one principal Imperfection in all modern Water-Works, whereas in all other hydraulick Engines the Forcers or Pistons operate upon the Water by Strokes alternately revers'd, with a rectilinear Motion, which occasions a Loss of Power, Time, and Water ; which is made to flow unequally, and per Saltum, through the Force-Pipes ; as is demonstrated by Draughts and Models.

3. Proposition, proposes a new Method for constructing of Fire-Engines, and applying a much greater Power thereto, and in a more commodious Manner ; which same Principles will serve also for constructing Ventilators, &c. as is shewn by Draughts.

NAVIGATION *and* MAGNETICKS.

1. Proposition, proposes a new Method for constructing the Chain-Pump, Capstane, and Wind-lafs, and for applying the Power thereto in a much greater Quantity, and more advantageous Manner, whereby those most necessary mechanical Organs and Engines will be rendered of more general Use in all Cases, but more especially on board Ships ; as is demonstrated by Draughts and Models.

2. Proposition, contains a new Method for weighing the Anchors of Ships, in a more safe expeditious Manner, whereby the Cable will be much saved and relieved from the great Strains, short sudden Bendings, and other Accidents, by which it becomes quickly destroy'd ; as is demonstrated by Draughts and Models.

3. Proposition, proposes a new Method for constructing the Rudders of Ships, and for hanging and applying them in a more commodious Manner for communicating Motion to the Ship ; as is exemplified by Draughts.

4. Proposition, proposes the Construction of a new fluid Quadrant, for taking more exactly and readily the Altitudes and angular Distances of the Coelestial Bodies, by Night as well as Day, without requiring any visible Horizon, Shade, &c. which Quadrant shews at one and the same Time and Observation, not only the Altitudes, but likewise the Azimuths and Amplitudes of the Objects observ'd, whether it be the Sun, Moon, fixt Stars, Planets, or Comets. As is demonstrated by Draughts.

5. Proposition, proposes some new Methods grounded on the Principles of Opticks, for finding with the horizontal Needle, the true angular Inclination which the magnetick Meridian hath with the true Meridian, and thereby shew the true Variation of the magnetick Needle or Compass, which is a Point still greatly wanted to the perfecting of Navigation. As is demonstrated by Draughts and Models.

6. Proposition, contains a farther Application of the same optical Principles, for finding with the Dipping Needle, the true Force and Direction of the magnetick Virtue, and thereby serve to perfect the Theory, and discover the true Direction, Properties and Laws of Magnetism. As is demonstrated by Draughts and Models.

7. Proposition, contains a farther Application of the same optical Principles, for improving the Compass, and rendering the same more exact for all Operations to be performed therewith, either for surveying by Land, or finding the true Way and Course of a Ship at Sea. And upon the same Principles it is propos'd, that the Azimuth Compass may likewise be improved, for finding more exactly the true Azimuth, and Amplitudes, of the Sun, and Stars. As is demonstrated by Draughts, &c.



GEORGE R.

GEORGE the Second, by the Grace of GOD King of *Great-Britain, France and Ireland*, Defender of the Faith, &c. To all to whom these Presents shall come, Greeting; Whereas Our Trusty and Well-beloved DAVID STEPHENSON, Master of Arts, hath humbly represented unto Us, that he hath with great Labour, Application and Expence compos'd a Book, in Folio, Entituled, (*MEDICINE made to agree with the INSTITUTIONS of NATURE, or a NEW MECHANICAL PRACTICE of PHYSICK, containing certain New and Infallible Methods, Principles and Machines, for Preserving Health and Curing Diseases*) He hath therefore humbly pray'd Us to grant him the said *David Stephenson* Our Royal Privilege and Licence, for the sole Printing, Publishing, and Vending the said Book, and likewise for the Making and Vending of all the several Machines, Instruments, and Apparatus thereunto belonging, for the Term of Fourteen Years. We being graciously inclin'd to give all due Encouragement to Works that may be of publick Use and Benefit, are pleased to condescend to his Request; and do by these Presents (as far as may be agreeable to the Statute in that Case made and provided) give and grant to the said *David Stephenson*, his Executors, Administrators and Assigns, Our Royal Privilege and Licence for the sole Printing, Publishing and Vending the said Book, and likewise for the Making and Vending of all the several Machines, Instruments and Apparatus thereunto belonging, for and during the Term of Fourteen Years to be computed from the Day of the Date hereof; strictly forbidding all Our Subjects within Our Kingdoms and Dominions to reprint or abridge the said Book, in the like or any other Size or Manner whatsoever; or to import, buy, vend, utter, or distribute, any Copies thereof, Reprinted beyond the Seas, or of any of the Machines thereunto belonging, during the aforesaid Term of Fourteen Years, without the Consent and Approbation of the said *David Stephenson*, His Heirs, Executors, Administrators, or Assigns, under their Hands and Seals, first had and obtain'd, as they will answer the contrary at their Peril: Whereof the Commissioners and other Officers of the Customs, the Master, Wardens and Company of *Stationers* are to take Notice, that due Obedience be render'd to this Our Pleasure herein declared.

Given at Our Court at *Kensington* the Thirty-first Day of *July* 1744, in the Eighteenth Year of Our Reign.

By His Majesty's Command,

HOLLES NEWCASTLE.

MEDICINE made to agree with the INSTITUTIONS
of N A T U R E ;

O R A

NEW MECHANICAL PRACTICE

O F

P H Y S I C K :

C O N T A I N I N G

Certain New Principles and Methods for *Preserving Health*, and *Curing Diseases* ; grounded on the Established Laws of NATURE, MOTION, and the ANIMAL OECONOMY : Wherein is given the *Solution, Demonstration, Use, and Application* of that Capital and most Useful, but hitherto Unregarded and Unattempted

P R O B L E M.

Shewing how to apply all the Mechanical Properties and Qualities of those three Catholick Agents and Instruments of N A T U R E, namely, AIR, WATER, and MOTION ; in all Degrees, Quantities, and Combinations, by proper Machines, either to the whole Human Body, or to any particular Region or Member thereof, and likewise to the Lungs, and Respiring Organs ; by which three General Principles, together with Aliment, all the Intentions and Alterations necessary to be produced in the Animal Solids and Fluids, for Attaining Health, Long Life, and the Cure of Diseases ; will become effected in the most Perfect, Safe, Expeditious, Universal Manner.

The Mechanical Solution of this CATHOLICK PROBLEM, so much wanted, being of all others the most Useful, as comprehending the whole MATERIA MEDICA, with the whole PRACTICE of PHYSICK, in its utmost Extent and Perfection ; is therefore propos'd as a Subject meriting the most serious Attention and Encouragement of the Publick, in order to bring the same to Perfection ; but more especially of all the Physicians in *Great Britain* and *Europe*, to whom it is humbly Address'd and Referr'd, and who it's hoped will employ their joint Endeavours towards bringing the same into Practice, for the General Benefit of Mankind.

By DAV. STEPHENSON, M. A.

————— *Si quid Novisti Rectius Iſtis,*
Candidus Imperte, ſi non, His Utere —————

HOR,

Sequamur N A T U R A M, in { CAUSIS SIMPLICEM,
EFFECTIBUS MULTIPLICEM.

L O N D O N :

Printed by J. HART for the A U T H O R. M D C C X L I V.

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P R E F A C E.

I. **S**IMPLICITY and UNIFORMITY are ever found to be the inseparable Criterion and distinguishing Characteristick of TRUTH, in all the Productions both of NATURE and ART. Of this simple Procedure of Nature, we are furnish'd with an admirable beautiful Instance, in the Case of the Centripetal Force, or the universal Attraction and Gravitation of Matter; by which one Simple Principle and General Law of Motion, acting in Conjunction with the Centrifugal Projectile Force, all the Phænomena relating to the Motions, Magnitudes, Distances, Densities, Orbits, Velocities, Periodical Revolutions, &c. of the Planets, both Primary and Secondary, with the Comets, which compose this Solar System, are most exactly adjusted and regulated. And we find moreover this great Principle and Law of Motion, the Attraction of Matter, extending its Dominion not only to the great inanimate Bodies within the Solar System, but likewise to the Animal, Vegetable, and Mineral Kingdoms; in such wise that under the Influence of this same General Law of Attraction, consider'd as acting under a particular Modification and Restriction, namely, the Attraction of Cohesion, all that relates to the Nutrition of the Solids, with the Secretion of the Fluids, in the Bodies of Animals and Vegetables, &c. are produced; the several Glands serving as so many Stomachs, Digestors, and Strainers, into which the Animal Fluids being discharg'd, having first undergone various Degrees of Tenuity and Velocity, in Circulating through the Arteries ministring to each Gland, which Arteries are more or less complicated and convolv'd, according to the Nature of the Fluids to be separated therefrom. Which Fluids being emptied into the Pelvis or Bason of each Gland, where having but a small Degree of projectile Motion, whereupon the Law of Gravity or Attraction being more at Liberty, and coming to take Place, the several Particles become thereby separated, ranged, and classed together, according to their similar Natures, Gravities, and attractive Powers; and being thus form'd into distinct Specifick Fluids, are afterwards discharg'd out of the Glands by proper secretory Vessels, which being imbued originally with their proper Liquor, attracts and receives (when in a natural healthful State) only such Parts of the Fluids as are of a homogeneous similar Nature and Texture therewith. We find moreover, that it is by this same Law of Attraction, that all the principal Processes and Operations in Chemistry are produced, such as Dissolution, Fermentation, Precipitation, Crytallization, with the Solution of Bodies by Menstruums, &c. Moreover by this same Principle it is that we are capable to explain and understand, by what Laws the Reflection and Refraction of the Rays of Light are effected; with what relates to the Nature of Colours, Opticks, Vision, &c. And thus we find how simple frugal Nature applies this one general Cause and Law of Motion, the Attraction of Matter, consider'd under different Circumstances and Modes of Acting, to the Production of almost all the Operations and Effects, both in the animate and inanimate System of Things.

2. As we never observe in the Works of Nature, more Causes, Instruments or Powers made use of, than what are just necessary to produce the Effect, or attain the End propos'd; so True Philosophy, conformable to this Precept of Nature, prescribes the following General Rules for our Observance and Conduct in our Researches after Truth; namely, never to make use of more Powers, Causes or Instruments, to produce any Effect, or to account for any Phænomenon, or the Production, Symptoms, and Cure, of any Disease; when fewer, or one alone, is sufficient and adequate to the Purpose. And never to make use of hypothetical, complex, remote, imaginary Causes or Principles, to explain any Appearance, Effect, or Disease; when the same can be done by Causes more simple, and such as we know to be actually and really existing in Fact. And to begin to reason, *à posteriori*, by proceeding from Effects and just Observations, to investigate the Causes; and from the Symptoms, to discover the original Disease. Of this simple true Method of Philosophizing, conformable to the Institutions of Nature, we are furnished with a most beautiful successful Specimen, in the Philosophy and Astronomy of the famous Sir *Isaac Newton*, wherein we find Him with incomparable Sagacity, by means of the foresaid simple Principle and General Law of Motion, namely, the Power of Gravity or Attraction, properly applied, to have demonstratively prov'd this to be the true original Cause and Spring by which all the Effects and Phænomena relating to the Theory of the celestial Motions are produced and govern'd; with what relates to the Doctrine of Light, Colours, Opticks, Vision, Elasticity, Animal Secretion, Nutrition, &c.

3. If now according to this great Exemplar and Model of Simplicity prescrib'd to us by Nature, we proceed to compare the New or *Newtonian* Philosophy and Astronomy, with that of the Antients, the very Simplicity of the former, as being grounded upon one obvious, self-evident Principle, namely, the Attraction of Matter, apply'd under different Modes of Operating, is sufficient alone to evince and establish the Truth and Excellency thereof preferable to all other Systems whatever; as being all embarrass'd more or less with many hypothetical, perplex'd, inexplicable

explicable Principles, that have no other Existence, but in the warm pregnant Imagination of their several Authors and Patrons.

4. If now we proceed in like Manner to compare the present State of Physick with that of the Antients, observing to make Simplicity of Principles, the Rule and Standard-Measure, according to which we pass Judgment thereupon, as in the foregoing Case, between the Old, and the New, or *Newtonian Philosophy*; I'm afraid the Conclusion will come out different to what it did in the other Case; and that it will be found, that the Practice of Physick in the primitive Ages was more simple and pure, as being grounded on fewer and more simple Principles, and those chiefly the Non-Naturals, and by which alone the Antients appear to have been fully as successful in the Cure of Diseases, as the Moderns, tho' assisted with all the endless Train and Possess of Medicines, that can be furnished from the Animal, Vegetable and Fossil Provinces. And if Simplicity of Principles be allow'd as the best Evidence and Criterion of Truth; however the modern State of Physick in respect to the Theory, may deserve the Preference to that of the Antients; yet in regard to the Practice, the same appears to have departed greatly from the aforesaid Standard Rule of Simplicity, as will become fully manifest upon examining into the modern Account and Catalogue of Diseases, with their Causes, Remedies, and the *Materia Medica*, all which are become increas'd without Number, Bounds, or End.

5. As we find therefore not only the great inanimate Machine of the Solar System, but likewise most of the other Operations and Effects in the material World, to be all regulated and governed chiefly by this one simple general Principle and Law of Motion, the Power of Gravity, considered as operating under different Restrictions and Limitations; we may conclude for certain, that as Nature is ever uniform and consistent in all her Works, that the Laws and Principles which she hath laid down for Government of the Microcosm, and for regulating the Movements of the living self-moving Machine of Animals, are but few and simple likewise; from whence it must necessarily follow, that the distinct original specific Diseases, which are only certain Perturbations and Irregularities in those few fundamental Laws and Principles of the Animal Economy, are but few in Number, and produc'd but from a few simple general Causes only, and may be all cured by the like few simple general Remedies also; as I shall endeavour to demonstrate in the following Essay. But shall first trace Physick back to its first Original, and consider it in its native State, and shew what are the true Principles thereof.

6. Physick being one of those Arts which the Law of Nature and Self-Preservation hath render'd absolutely necessary, is therefore in some measure communicated, known, and practis'd by all Mankind, the general Principles whereof being innate and congenite with the human Understanding; and consequently the Practice thereof must have had its Beginning from the Time that human Nature became first subject to Diseases; yet notwithstanding this its great Antiquity, with the many Additions, Alterations and Improvements, which it hath acquir'd in revolving thro' so many successive Ages, it is at this Time a general and real Complaint, and that among the best Physicians, that Physick is still involved in great Uncertainty and comparative Obscurity; for Proof whereof we need only refer to the almost infinite Number of Books that have been wrote relating both to the Theory and Practice of Physick, in all which, except what has been wrote by Drs. *Mead, Cheyne, Arbuthnot, Freind, Morgan*, and a few others, we meet with little else but perplex'd contradictory Theories, Hypotheses and Opinions; and as to the Practice of Physick, there we may with just Wonder and Astonishment observe, the Register and Catalogue of Diseases, with their Causes and Remedies, or the *Materia Medica*, daily increasing and multiplying beyond all possible Comprehension, to the utter Confusion and Discredit of true Physick.

7. Providence, as has been observ'd above, hath communicated the Knowledge and Practice of Physick in some Degree to all Mankind, having for that Purpose stamp'd and impress'd certain general immutable Laws and Principles upon the whole Animal Creation, by which every Animal becomes instructed and prompted to the Use of certain general Means, as are necessary both to preserve its Being in Life and Health, and to cure such Diseases as may happen thereto in the Course of its Existence; this Position we must either allow for true, or deny the Providence of God, by supposing Him to create any Beings without providing them with what is necessary for their Support and Existence, and instructing them also in general, how, in what Cases, Quantities, Times, Seasons, and other Circumstances, they ought to use and apply them, for attaining the aforesaid Ends. And upon this Principle is grounded that common proverbial Saying, That every Person at Forty, is either a Physician or Fool; plainly implying, that God hath put it in the Power of every Person, with using due Reflection and Attention to the general Rules and Means of Health, thus prescrib'd by Nature and the Universal Reason common to Mankind, to become in a great Measure and for ordinary their own Physicians. And thus, for Example, we observe, that all Mankind being taught by the Law of Nature and Self-Preservation, (as Brutes are by Instinct) as soon as they find themselves arrested with any Disease, do naturally, and of their own Accord, betake themselves either to total Fasting and Abstinence for a Time, or to a temperate, light, low Diet, and Regimen; and if they observe Nature indicating or inclining to get rid of the Distemper, either by Vomiting, Sweating, &c. to be ready to forward and promote her Intentions, which are always best effected by the most simple Means and Medicines. The due Observance of which plain, obvious General Rules, thus prescrib'd and communicated to all Mankind by the Voice of Nature and

and universal Reason, will always prove the true Asylum and Sanctuary from the Pursuit and Attacks of every Disease; and if timely attended to, and diligently persever'd in, will never fail to bring the Distemper to capitulate and surrender.

8. From what hath been said it follows, That those universal, immutable Laws, Principles, and Rules of Health, coeval and congenite with humane Nature, are the only original, perfect Plan and Foundation of true rational Physick, and by which as an infallible Touchstone, and distinguishing Criterion, one may readily discover the Difference between the Practice of Physick that is natural, true and genuine, from what is false, spurious and corrupt; that being ever the purest and most perfect, which comes nearest to, and agrees best with the original Plan and System of Institutions ordain'd by Providence.

9. From what hath been before remark'd it likewise follows, That it is only from a rational Freedom of Inquiry and Reasoning, grounded upon accurate Experiments and just Observations, join'd to a diligent Attention to, and proper Use and Application of those general Means and Rules of Health, prescrib'd to us by the Author of Nature, that we can expect to see Physick improv'd, and rescued from its present State of Confusion and sceptical Empiricism, with the heavy Yoke of Bondage and Tyranny, to which it hath been long subject, through the Ignorance, Avarice and Artifice, of Quacks, and certain Dealers and Traders, both in the Galenical and Chemical Pharmacy.

10. Physick, like all other Professions, Faculties and Arts, being subject to become corrupt, and to depart from its primitive Rectitude, through the Innovations and Craft of designing Men, ever prone and inclin'd to Novelty and Change. Whensoever this happens to be the Case, there is but one Way to set them Right, and to come at the Truth again; and that is by bringing them back to their Original, and comparing them with the standard, immutable Laws and Rules of Nature and universal Reason. In order then to discover what are the first true General Principles of Medicine or Physick, we must for that End trace it up to its first Source and Spring-Head, and compare it with the original Plan of Nature, the only great and best Physician, and for this Purpose we are to consider what are the general Means and Principles ordain'd by God, as absolutely necessary to the Continuance of animal Life; now these we shall find to be Aliment; Air; Elementary Fire or Heat; Motion or Exercise; with the Passions; which general Principles, according as they are regularly, or irregularly used and apply'd, are the true, original, universal Causes and Instruments of Animal Life, Health, and Diseases; and as they are the true and proper Causes of all Diseases; so by necessary Consequence they must be the only true, proper Means and Remedies for the Cure of all Diseases.

11. Taking the foresaid General Principles to be designed by the Author of Nature as the only true *Materia Medica*, and original Plan of Physick, from which alone we are to seek the true Means for preserving Health, and likewise the productive Causes of all Diseases, with the true and proper Means and Remedies for Curing the same. Conformable whereunto, and in Imitation of this original, most perfect simple Plan, Exemplar and Model of Nature, I have attempted the Composition of this Treatise, containing a new Mechanical Practice of Physick, wherein I have reduced all the Means of Health, with the Causes and Remedies of all Diseases (except such as are hereditary and impress'd upon the first original Stamina of the Animal Machine) to Aliment, Water, Air, Elementary Fire, Motion, and the Passions; wherein I have describ'd and demonstrated by proper Draughts, &c. divers new Methods and Practices for applying the Mechanical Properties and Qualities of Air, Water, and Motion, by proper Machines to the humane Body, both universally, and partially, and likewise to the Lungs and respiring Organs; whereby all the Intentions, Alterations and Effects that either can, or are necessary to be produced in the Animal Solids and Fluids, either for Preserving Health, or for the Cure of all Diseases, will become effected in the most perfect, safe, certain, expeditious, universal Manner. In consequence of which new Methods, the whole *Materia Medica* and Practice of Physick will become reduced to the foresaid Catholick Principles and Remedies of Nature's Appointment, and rescued from the unjust Usurpations and Innovations of the Ignorant and Crafty, who instead of following the plain, simple, obvious Rules of Nature, are ever holding forth false Lights, and endeavouring to impose upon Mankind perplex'd imaginary Systems of their own Invention; by which Methods the Practice of Physick is now fallen into the greatest comparative Confusion, Discredit and Dishonour.

12. But here I think it necessary, before I proceed further, to remove what appears to me to be an ill-grounded erroneous Opinion, that seems to have prevail'd of late; and this the rather, inasmuch as it seems greatly to countenance and give rise to several Practices of the most pernicious Consequence, and which naturally tend to sap and undermine the very Foundation of all true Rational Physick; and that is relating to the original Generation and Production of Diseases, with respect to which some Physicians as well as Philosophers seem to give into the Opinion, that Diseases specifically new are daily springing up, that were never known or had any Existence before; but this I think a very absurd and unphilosophical Opinion, for this very evident Reason, That allowing this Opinion to be True, the present establish'd Order of Nature and Second Causes must be thereupon subject to perpetual Alteration; for if we allow the Bodies of Men to be specifically the same now, as in former Ages; abating for particular Circumstances and

Accidents, they must be equally liable to the same specifick Diseases at one Time as another, supposing the Presence and Agency of the same productive Causes; but as we have no Reason to think that either the Bodies of Men, or any other Part of Nature, or Second Causes, have undergone any essential Alteration from what they were in past Ages, consequently whatever Diseases we find them subject to at one Time, we may conclude they were equally liable to be attack'd and arrested by the very same Distempers at any other Period of Time, supposing the Presence and Influence of the same productive Causes. Indeed I allow, that as one Age or Period of Time may differ greatly from another in Point of Virtue, Industry, and Temperance; so the Bodies of Men with their Offspring and Children, will be found to differ greatly also, in one Age and Period of Time from another. Thus in an Age of Temperance, Sobriety, and Industry, the Bodies of Men with those of their Progeny will be more healthful, stronger, and fitter for all Kinds of Labour and Martial Exercise; whereas in an Age of Luxury, Intemperance and Idleness, (too much the prevailing Vices of the present Times) they will become necessarily more unhealthful, relax'd, weak, and effeminate; which morbid Constitutional Imperfections will become intail'd by Hereditary Right upon their Posterity. Likewise in an Age of Temperance and Industry, Diseases will appear less frequent, and not so rife, violent, and fatal, as in an Age of Intemperance and Dissoluteness: But all this while there is not the least Room or Ground to conclude from thence, that any Disease specifically New has been at all introduced, by reason the Bodies of Men, which are the material Subject, Cause, Substratum, and Seminum of all Diseases whatever, are essentially the same at all Times, and the productive Causes of all Diseases are also essentially the same, no Part of Nature or Second Causes being at all essentially chang'd. So that the Diseases of one Age, Season, or Period of Time, can only differ circumstantially and accidentally from those of any other Age, Season, or Period of Time; that is, in respect of their Frequency, Malignity, Rifeness, Violence, Universality, Mortality, &c. And from this Consideration it appears how extremely trifling and vain it is for to dispute and argue about the first Original Appearance of any Diseases, as hath been done of late with much Contention and Warmth by some otherwise learned Authors, as in the Case of the Venereal Disease, &c. Forasmuch as this and all other Distempers may date their Existence from the same Era and Epocha of Time, being all virtually, potentially, and seminally, tho' not actually, coexisting *ab Initio*. From whence may be drawn the following practical Conclusion and Rule, That as the Diseases incident to Mankind are specifically the same in all Ages and Seasons, excepting only in respect of the accidental Differences and Circumstances aforesaid, it follows by necessary Consequence, that Physick, or the Art of preserving Health, and curing Diseases, ought for to be essentially one and the same in all Ages and Periods likewise, excepting only in circumstantial Differences as to what regards the Majus and Minus, or the greater and lesser Apparatus; for as the same general specifick original Diseases differ only in Degrees, Accidents, and Circumstances, in one Age or Period of Time from another; so the Means and Remedies for curing them require only to be stronger or weaker, and diversified with respect to Circumstances of Time, Place, Quantities, Qualities, &c. accordingly.

13. I have digress'd and insisted the longer in laying open the Absurdity and Fallacy of the aforesaid Opinion, forasmuch as it seems calculated on purpose to patronize the present modern Practice of increasing the Catalogue and Number of Diseases, with their Causes, and the *Materia Medica*, infinitely without Number or End, to the utter Confusion and Discredit of Physick; which is become render'd thereby like to a perfect Chaos, over which there rests a thick impenetrable Gloom and Darkness, wherein if a Person once enters, he will run a great Hazard of being bewilder'd and lost, as to what real Service he can do either to himself, or the rest of Mankind. For from what has been said in the last preceding Number it follows, that the Practice of Physick ought to be ever simple, plain, invariable, and essentially the same throughout all Ages; allowing only for some accidental Differences and Circumstances, whereas was this modern Opinion true, Physick can have no established Rules or Principles, neither as to Theory nor Practice, nor any Limits or Bounds affixed thereto, but must be ever changing, according as the Diseases change, and other new ones become introduced, in like Manner as we change our Cloaths, according to the prevailing new Taste and Fashion of the Times; whereas true Physick both with regard to the Theory and Practice, is ever immutably one and the same, both being necessarily founded upon the eternal, unchangeable, establish'd Order of Nature, and the mutual Relation of Second Causes.

14. From what hath been said it appears, that the distinct original Specifick Diseases, and general morbid Constitutions, are but few and essentially the same in all Ages and Seasons, allowing for some accidental Differences and Circumstances; from whence it follows, that the Remedies proper for curing the said specifick Diseases may be reduced to a like Simplicity also, which would be doing the greatest Service to true Physick, which is become overwhelm'd with an endless infinite Number of Medicines, the greatest Part whereof are not only of no Manner of Use, but for the most Part destructive of the Health of Mankind. And this very great and sore Evil of increasing the *Materia Medica*, and Catalogue of Medicines, by a vain endless Research after the Discovery of new Remedies, appears to take its Rise and to be introduced along with the aforesaid new Opinion and Hypothesis, as being a natural necessary Consequence following therefrom, which meeting with Countenance and Encouragement from such as traffick in Medicines, and more especially from the Address and Industry of some designing Enthusiastick Chemists, who after a long and fruitless

Research in Quest of the Philosopher's Stone, &c. began at last to offer their Assistance and Labours towards the Improvement of Physick, by applying and setting their all-transforming, wonder-working Engine and universal Menstruum, the Fire, to work, in order to prepare universal Remedies, Specificks, Nostrums, &c. for the Cure of all Diseases; but hitherto all in vain and to no Purpose; for however Chemistry must be allowed to be very useful, when properly apply'd and directed to what is its proper End, that is, to the Improvement of the mechanical commercial Arts, Trades, and Manufactures, and likewise to natural Experimental Philosophy, yet ever since its Application to Physick, which is but of modern Date, the Practice of Physick I think never has, and in all Probability never will, receive any real Benefit therefrom, if not infinite Prejudice and Damage, there being no Manner of Affinity, Congruity, and Agreement between the Principles which compose animal Bodies, and such Medicines as are only the fortuitous, sportive, forc'd Productions of intense artificial Fires, which Remedies being absorb'd and impregnated with so much concentrated Fire and saline Spiculæ, &c. are much better fitted to tear, rend and destroy, than to repair and restore the animal Machine.

15. From the Methods and Practices describ'd in this Treatise, for preserving Health, and curing Diseases, with the occasional Remarks added thereupon, I think it may be laid down as a fundamental Maxim and Aphorism, and which is as demonstrable from the Laws of animal Mechanism, as any Proposition in *Euclid*, That Aliment, Water, Air, elementary Fire or Heat, Motion or Exercise, with the Passions; are the primary Catholick Instruments of Animal Life, Health, and Diseases; and that whatever Intentions and Alterations are necessary to be produced in the Animal Solids, and Fluids, either for preserving Health, or curing Diseases; may be more expeditiously, safely, certainly, and universally effected, by applying the mechanical Properties and Qualities of the said universal Principles and Remedies, by proper Machines, to the human Body, and its Parts; than by all the endless Medley of Medicines wherewith the *Materia Medica* now superabounds. Let us therefore with the primitive great Physicians learn to hearken to the Voice, and follow the plain simple Precepts of Nature; and turn our Enquiries to find out what mechanical Effects Aliment, Water, Air, Motion, and the Passions, have upon Animal Bodies, consider'd as operating thereupon with all their Properties and Qualities, and that in all Degrees, Quantities, Alternations, and Combinations, separately, or jointly; with what Diseases are produced therefrom, and by what Methods the said general Causes may be converted into the most efficacious Means and Remedies for curing all the said Diseases. And abandoning the vain endless Research after the Qualities of every insignificant useless Drug, let us make the aforesaid Catholick Capital Principles and Remedies of Nature's Appointment, the whole of our Study, and the only sure Foundation of Practice, in the due and proper Use and Application whereof, we shall find all the Means necessary for preserving Health, and the Cure of Diseases.

16. As the Methods describ'd in this Treatise for preserving Health, and curing Diseases, are entirely new, I am sensible this Undertaking of mine will undergo various Tests and Trials, and be either approv'd or condemn'd, according to the different Understandings, Interests, and Inclinations of Men; not doubting but it will be ridicul'd and descry'd by your nominal Pseudo-Physicians, Specificians, Empiricks, &c. For whoever will attempt to encounter vulgar Errors and Practices, must expect to be run down as far as possible by popular Noise and Clamour; and likewise whoever attempts to introduce any Thing new into Practice, let the same be ever so useful, must lay his Account to meet with Opposition, arising from the different Views, Interests, and Passions of Men, it being no easy Matter to overcome popular receiv'd Opinions and Prejudices, and to bring Persons to change their old, for a new Way of Thinking and Acting; until Time, Experience, and the Example of Persons of clear disinterested Reason and Judgment, bring them to see their Error. However, let the Event be what it will, or let who will oppose this Undertaking, I take Encouragement and place my Hopes of Success wholly in this, That as the whole is founded upon the original Plan of Nature, so I doubt not but that like a House built upon a Rock, it will stand its Ground in Spite of all Opposition, and will at last, like Truth, in due Time prevail.

17. The End and Design of this Treatise, being to restore Physick to its primitive Simplicity and native Purity, by bringing it to correspond and agree with the general Laws and original Institutions of Nature; the same might very justly claim the Attention and favourable Reception of the Publick, was the Performance executed answerable to the Importance, Usefulness, and Dignity of the Subject; which if it hath suffer'd through my Incapacity, I hope at least what I have done, will serve to excite and set some abler Head and Hand to work to compleat and perfect the Plan and Undertaking, which of all others is the most noble, useful and extensive, as having the most immediate Connection with the temporal Happiness of Mankind. And if I may be indulg'd the Liberty of passing a general Judgment thereupon myself, without being suspected of Partiality, I humbly think there is nothing advanc'd in this Treatise but what is strictly agreeable to the Principles of true Philosophy, and the most perfect Theories of the Animal Œconomy, with the establish'd Laws of Motion, and Animal Mechanism; so far as the same are yet known and discover'd. But conscious how apt Mankind are to be bias'd and misled by Self-Interest, and not willing to trust altogether to my own Judgment in this Affair wherein I am so much a Party interested, I have for that Reason consulted some of the most learned and experienced Physicians there-
upon,

upon, and have had the Satisfaction of their Approbation; I have never heard any material Objection to the Principles and Practices describ'd in this Treatise; the only Objection I have met with, is the Difficulty of reducing it into Practice, partly on account of the Apparatus and Machinry, and likewise from the Prejudices of Physicians and Surgeons, who will be unwilling to resign and lay down their old, and to adopt a new Practice; as to the former Part of the Objection, it is to be consider'd, that most, if not all the best Inventions, and most useful Discoveries have been subject to the like Objection at their first Appearance, and have been thought clogg'd and embarrass'd with invincible Difficulties, which yet have been happily surmounted afterwards by future Application and Industry, and I doubt not in the least but this present Undertaking will be attended with the like Success, as the same is founded upon true and rational Principles; so that to this Part of the Objection relating to the Difficulty of bringing those new Methods into Practice, it will be sufficient at present if I answer thereto in the Words of the Poet, *Labor improbus omnia vincit*. And as to the latter Part of the Objection, I doubt not but Time, Experience and Facts will convince the World of the universal Usefulness of this Undertaking. And therefore as the bringing it into Practice will be of the greatest Advantage to the Publick, so I hope proper Methods will be taken for that Purpose.

18. I am withal at the same Time sensible how very unequal my Abilities are for such an Undertaking, and to the great Importance, Dignity and Usefulness of the Subjects here treated of, which would have deserv'd the Labours of a much abler Pen, to have set them in a truer and more perfect Light, and am moreover conscious with myself of many Imperfections in the Style, Order and Method of treating the same. However, considering that the Methods and Practices here propos'd and describ'd are entirely new, and if what I have advanc'd upon those Subjects be but intelligible, and appear withal to be grounded upon true rational Principles; I am satisfied that every candid unprejudiced Reader will readily pardon whatever Defects may be found therein, with respect to the Accuracy of the Method, Style, &c. Truth and Reason being the only great Point, and Standard Rule and Measure that ought always to be regarded and kept in View, in examining and passing Judgment upon this, and all other the like Performances; and however, it be but a rough unfinish'd Piece, as being yet but in a State of Embrionism and unform'd, yet am I not afraid to venture it abroad into the World and let it see the open Light, being willing to submit it to a fair impartial Examination and Trial, provided that I be allow'd to bring Nature, Truth, Experience, and Facts, for my Evidence, and have Reason for my Judge. Remembring withal, before passing Judgment, the following Advice and Caution.

————— *in Magnis, & Voluisse, sat est.*

PROPERT.

Nihil est ex omni parte Perfectum.



GENERAL CONTENTS.

INTRODUCTION.

CONTAINS some general Observations on the Animal Œconomy, with the Nature, Production and Cure of Diseases; wherein the Mechanical Operation and Effects of Medicines are accounted for upon new and more simple Principles. Whereunto are subjoin'd some general Propositions and Problems, shewing, That by the Pressure, with the other Properties and Qualities of the Air, and Water, &c. judiciously and properly apply'd to the Humane Body, all the Intentions and Alterations necessary to be produc'd in the Animal Solids and Fluids, either for Preserving Health, or the Cure of Diseases, may be effected in the most perfect, safe, expeditious, universal Manner, &c.

CHAP. I.

General Observations on the Mechanical Operation of Bathing, wherein the salutary good Effects of this universal Remedy are shewn to be in a great Measure lost, according to the present Practice of applying the same. Wherein is described the Construction and Use of a new Machine and Apparatus, whereby Bathing of all Kinds will be render'd infinitely more efficacious and successful, not only in all the Cases and Diseases wherein it is now found beneficial, but in many other Distempers and Cases to which the present Method of Bathing will no wise extend. Which same Machine will serve also either as an universal or partial Vapour-Bath, either for humid or dry Irroration and Fumigation of the Body. By which Means the Practice of Bathing, which at present is very much limited and circumscrib'd in its Effects, will receive the greatest Improvements, and be render'd the most sovereign, perfect, universal Means for Preserving Health, and the Cure of Diseases. As is demonstrated by Draughts.

CHAP. II.

General Reflections on the Mechanical Operation and Effects of the Air, consider'd as apply'd and operating upon the whole external humane Body; wherein is describ'd the Construction and Use of a new artificial Atmosphere or Air-Bath, by which the Air, that universal Cause and Principle of Animal Life, Health and Diseases, may be made to operate upon the humane Body with all its Properties and Qualities of Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, Motion, &c. regulated, changed and adjusted, in all Quantities, Proportions and Combinations; whereby all the Intentions and Effects necessary to be produced in the animal Solids and Fluids, either for the Preservation of Health, or Cure of Diseases, may be effected in the most successful, safe, perfect and universal Manner. As is demonstrated by Draughts.

CHAP. III.

General Remarks upon the Mechanical Effects produced in the Blood and animal Fluids, by the constant joint Operation and Mechanism of the Lungs and Air thereupon. Wherein the principal End and Use of Respiration is briefly consider'd, together with another new and important Office and Use assign'd thereto. Herein also is describ'd the Construction, Use and Application of an artificial Atmosphere, whereby the Air may be made to operate upon the Lungs and respiring Organs with all its Properties and Qualities, so regulated, intended and remitted in all Quantities, Proportions and Combinations, until they are brought to act with a Momentum and Force, as suits best with the constitutional State and Structure of the respiring Organs of every individual Person; and as will answer best with the present Indications and curative Intentions; whereby all such Diseases as are produced from a faulty, imperfect Respiration and Sanguification, (which is the true, general, original Cause of most of the capital Diseases) will receive a perfect, safe, lasting Cure. There being no other possible Cure for such Diseases as proceed from the Properties and Qualities of the Air, operating with a Momentum and Force relatively disproportionate to the organical Structure of the respiring Organs, than by changing the Air, and causing it to operate with contrary Properties, &c. As is demonstrated by Draughts.

CHAP. IV.

General Observations upon the Mechanical Influence and Effects of the Air upon Animal Bodies, consider'd under the Head of Exercise. With the Construction, Description, Use and Application of a new Machine and artificial Atmosphere, which may have its Properties and Qualities

ties so proportion'd, intended and remitted in all Degrees ; and being judiciously and properly apply'd, and made for to operate either universally upon the whole external Body, or only topically and partially upon some Region or Member thereof, will prove the most salutary, perfect and universal of all Kinds of Exercise for the Preservation of Health, and likewise the most efficacious, successful, universal Means and Remedy for the Cure of most Diseases. As is demonstrated by Draughts.

C H A P. V.

General Remarks upon the Mechanical Operations and Effects of the Air upon the Humane Body, when excited and put into a tremulous, vibrative, oscillatory Motion by some strongly sonorous Bodies or Instruments ; wherein a general Method is describ'd for constructing a sounding Phonick Machine or Chamber, with the surprizing great Effects that may be produced in the animal Solids and Fluids by the Air, when thus modified and put into such a particular State and Law of Motion, and being properly collected, judiciously apply'd, and made to operate upon the humane Body either universally, or only partially and topically, will prove the most perfect, salutary, universal Exercise for the Establishment of Health ; and also the most safe, sovereign Means and Remedy for the Cure of most Diseases, and local Ailments. As is demonstrated by Draughts.

C H A P. VI.

Contains a new Method for constructing Vapour-Baths, both humid and dry ; and of applying them either universally to the whole Body, or only locally, for Fumigating and Bathing some particular Region or Member thereof. Wherein also is shewn how that universal Principle the Pressure of the Air, and other Fluids, may be apply'd in all Degrees to all Parts of the Body : With the great and good Effects that may be produced thereby in the animal Solids and Fluids, when thus properly and judiciously apply'd by proper Machines. As is demonstrated by Draughts.

C H A P. VII.

General Observations on the Structure, Mechanism, and morbid Affections of the Stomach, with its Appendage the Intestines or alimentary Tube ; shewing this primary compound Gland and Organ, when disorder'd and incapacitated for executing its Office duly, to be the true, original Cause, Spring and Seat where most of the catholick capital Diseases have their first Rise and Growth, as the Colic, Iliac Passion, Ruptures, Tympanies, Emphysema's, Consumptions, Asthma's, Dropsies, Atrophies, Apoplexies, Epilepsies, Vertigo's, Hydrocephalies, Palsies, Inflammations of the Brain and its Membranes ; Phrensies, Mania's, with the hypochondriac and hysteric Affections, &c. wherein is described a new Mechanical Method and Apparatus for Curing or giving Relief in the above Cases. As is shewn by Draughts.

C H A P. VIII.

Proposes a new Mechanical Method and Apparatus for the Cure of cutaneous Diseases, and external local Maladies, as Wounds, Ulcers, Tumors, Inflammations, Gangrenes, Hemorrhages, Venereal Distemper, &c. by Means of Air, &c. judiciously apply'd by proper Machines to the Parts affected, and made to operate thereupon with their Properties and Qualities regulated and adjusted in all Quantities, Proportions and Combinations, as will suit best with the Indications of Cure. As is demonstrated by Draughts.

C H A P. IX.

Contains the Construction, Description, Use and Application of a new Instrument for measuring the most minute Alterations produced in the Dimensions of the Humane Body, either by the different Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, &c. of the Atmosphere ; or from Motion, Rest, Sickness, Evacuation, Retention, Passions, Eating, Fasting, or any other Causes whatsoever. With its Use and Application for Essaying and Measuring the Alterations and Effects produced in the animal Solids and Fluids, by any of the aforesaid or other Causes ; which Instrument will serve to discover the comparative, relative State and Force of the Solids, with respect to the Degrees of their Contraction and Relaxation ; as also the State of the Fluids, with respect to the Degrees of their Rarefaction and Condensation ; and as such will serve as a very useful Monitor, whereby a Person may form a tolerable good Judgment of the comparative State and Force of his Solids and Fluids, and receive timely previous Notice therefrom, when the animal Machine and Ballance of Health begins to lean and verge towards a distemper'd State ; from whence proper Diagnosticks, Prognosticks, and Indications may be deduced to direct to Practice, both for the Prevention, and Cure of Diseases. As is demonstrated by Draughts, &c.

INTRODUCTION.

1. **B**EFORE I proceed to the Consideration of the distinct Parts and Subjects of this Treatise, shall first by way of Introduction, offer some preliminary Observations relating to the Nature and Origine of Diseases, with their general productive Causes, and the mechanical Properties, Effects and Operations of Medicines, whereunto I shall subjoin some general Propositions and Problems, which serve as the Basis of the several new Methods and Practices for preserving Health, and the Cure of Diseases, as may be found describ'd in this Treatise.

2. First then I observe, that among Second Causes, Motion is the principal immediate Agent and Instrument of all the Effects, Operations and Phænomena that are produced in the material Universe, and is the primary Cause upon which the Power, Force and Energy of every Body or System of Bodies wholly depends. For Matter or Bodies without Motion, can neither suffer any Change in themselves, nor produce any Change or Alteration in other Bodies, but would remain for ever in a State of absolute Rest and Inactivity; so that whatever Changes or Mutations happen in Bodies, the same are all necessarily produced by Motion, either added thereto, or substracted therefrom. For which Reason we find, that according to the present establish'd Order of Nature, Matter and Motion are render'd inseperable, the whole System of Matter, and all material Beings, both animate and inanimate, being for ever subject to some Degree of Motion, more or less, by which they are kept in a continual Circulation and Fluxion, and thereby fitted to undergo and pass through different States, Forms, Periods, and Appearances, according to the final Ends and Appointments of Providence. And thus we observe, that all animal and vegetable Bodies, from the highest to the lowest Degree in the Scale of Life, as well as all other material Beings, even the great Planetary and Cometary Bodies themselves which compose this Solar System, are constituted and form'd to continue only for a certain Revolution and Period, some longer, some shorter, which is no other than a progressive Motion, whereby they pass through different Scenes and States, and put on different Forms and Appearances, which when accomplish'd, they become resolv'd again into the general elementary Mass of Matter, though even then they are neither divested of Existence, nor Motion, but are still in a Progression to new Life, Form, and Being.

3. From whence follows this fundamental physical Conclusion and Proposition, that no animal organiz'd Body, &c. can suffer or become subject to any Alteration or Change, either from Health to Sicknes, or from Sicknes to Health; but by some Quantity of Motion either communicated thereto, or substracted therefrom; let the Causes communicating or substracting the Motion, be what they will, material or immaterial. And consequently all Medicines, Means, and Methods for preserving Health, and curing Diseases, be they of what Kind soever, or apply'd in what Manner soever, either internally or externally; and let them operate by what mechanical Properties, Powers, or Qualities soever, either by their Fluidity, Gravity, Elasticity, Pressure, Attraction, Stimulation, Momentum, Attrition, Friction, Motion, Heat, Cold, Humidity, Dryness, Effluvia, &c. yet still the ultimate Effect of all such Medicines and Means, resolves at last and consists only in the real Quantity of Motion which they either add to, or substract from the animal Machine, or some one or more of its Parts and Organs.

4. As animal Life consists in a fitly organiz'd Body or Machine, endow'd with a certain Quantity of Motion or moving Force, consequently that must be the most perfect Practice of Physick, or the most rational successful Method for preserving the Health and curing the Diseases of the said Body or Machine, which teaches the best Methods and Means for regulating its Motions, by adding or substracting Motion to, and from the same, in all Quantities, according as it becomes deficient, or redundant, so as to preserve a due Ballance, and such a Quantity of Motion in the whole Machine, and all its Parts, as agrees best therewith.

5. Now in order to ascertain the just Boundaries and Pretensions of Physick and Physicians, and to determine how far and in what Cases humane Knowledge and Art can be assisting in preserving Health, and in curing Diseases; it will be necessary to look back to the first original State and Beginning of the humane Body, which consists of two general Principles, the Solids and Fluids; now as to the animal Solids, it is to be observ'd, that the original elementary Principles and Stamina which compose the first infinitesimal nascent Solids, are interwoven, platted and twisted together in such a peculiar Manner, whereby they acquire a certain determinate Degree of Cohesion, Strength, and Elasticity, which can never be mended or altered for the better afterwards; it being absolutely out of the Power of humane Art, and of all the Medicines in Nature, to impart or communicate to any one single original elementary solid Fiber, or to a Bundle or System of those Fibers, such as all animal Bodies are compos'd of, a greater Degree of moving Force, Strength, and Elasticity, &c. than what they receiv'd, by virtue of their first primæval Formation, Structure and Composition.

6. The elementary Stamina and Principles of the animal Solids, admit of infinite Variety in their original Assemblage, Arrangement, and Composition, and in the different Manner in which they are twisted, modified, and interwoven together; from both which Causes arise those differential Signatures, which serve to characterize and diversify the Constitutions, Genius, Temperament, &c. in both Sexes, and in the several Individuals of each Sex.

7. The whole moving Force whereby the animal Fluids become at first put into a State of Motion, Heat, and Fluidity, and continued therein, is intrinsically belonging to the animal Solids, as their peculiar Property alone, the Fluids having no Tendency nor Principle of Motion in themselves, and are only moved, attenuated and circulated by the innate Spring and Elasticity of the Solids, which Momentum or Quantity of moving Force in the Solids, can't, as has been before observ'd, be rais'd above a certain Pitch and Degree, depending upon their original Composition and Contexture, which admits of no Amendment from humane Art.

8. From whence it follows, that every individual Animal, by virtue of the original Composition, Texture, and Strength of its Solids, becomes endow'd with a certain determinate moving Force, whereby it becomes fitted for living, moving, and circulating a certain Quantity of Fluids, with the greatest Advantage, for a certain Duration and Space of Time. In the regular Government and Exercise of which moving Force, in the several Stages of Life, consists the Health and Longevity of every Animal; to the End therefore that the animal Machine may have its Existence protracted to the utmost Period that Nature allows, it is necessary that all its Motions be duly regulated in proportion to the original Formation and Composition of its Solids, so as neither to suffer its Motions to be too much accelerated, or retarded; nor too long continued, or intermitted, &c. Thus for Example, if this moving Force of the Solids be suffer'd to rise too high and to become too exorbitant and accumulated, the Animal will have its Growth unduly accelerated, and arrive the sooner at its full State, Maturity, and Dissolution, and become the more subject withal to Diseases of the acute inflammatory Kind; and on the contrary, if this moving Force of the Solids be suffer'd to flag and become too much depress'd and languid, or not duly exerted; the Solids will be hinder'd from developing and expanding duly, and the Animal will arrive the later at its full Growth and Dissolution, but become the more subject withal to Diseases of the Chronick Kind. So that between those two Extreams of too great and too small a Motion, it is that we are to look for the golden Mean and true Path that leads to the Temple of Health and Longevity.

9. And from hence follows this physical Paradox, that supposing any two Animals of the same Species, to have the original System of their Solids and Fluids constituted as greatly different as possible in respect of Strength, yet provided they be form'd similarly and alike in all Parts, the weakest shall notwithstanding live as long as the strongest, provided all their Motions be regulated alike, and in proportion to the original Strength and moving Force of their respective Solids. And from thence follows this general Conclusion and Proposition, that the Periods of animal Life abstracting from Casualties and Accidents, depend upon the just Regulation and Management of the Motions of the Body, by keeping them within proper Bounds, that is proportionate to the moving Power and Strength wherewith the Solids are originally endow'd.

10. However the animal Solids can't possibly receive from humane Art any greater Degree of moving Force, than what they derive from their first original Composition, yet nevertheless the same may occasionally, from the Influence of some extrinsick Causes, have their moving Force rais'd higher, or depress'd lower, than what is consistent with Longevity, and a continued State of Health; and in this Respect only, it is, that they come properly under the Direction and Management of the Physician, whose chief Business is to have a watchful Eye and Regard to those two principal opposite States of the Solids, by minding carefully to constringe and relax, or to raise and lower their moving Force at proper Times, so as to keep them within due Limits and Bounds, and in a fit State and Condition for circulating the Fluids; and for that Purpose he must have a strict Regard at the same Time also, that the Fluids be kept of a proper Quantity, that is such as is proportionate to the moving Power of the Solids, and likewise that they have all the Qualities necessary to fit them for the several Offices of the animal Œconomy. Which general Intentions relating to the Solids and Fluids, with the proper Means and Medicines for effecting the same, comprehends the whole Practice of Physick, and all that humane Art can possibly do towards obtaining Health, Longevity, with the Cure of Diseases.

11. The humane Body may be truly and really consider'd as a compound hydraulick Machine, consisting of many single Machines, each particular Gland, Organ and Muscle how small soever, such as the Stomach with the alimentary Tube and lacteal Vessels; the Heart with its System of Arteries and Veins; the Brain and nervous System; the Liver, Spleen, Kidneys, Testes, Pancreas, &c. being all so many distinct hydraulick Engines, except the Lungs, which consisting of a System of sanguineous and Air-Vessels, may be properly called a Pneumatico-hydraulick Engine; all which several Organs, Glands, or Muscles, being compos'd of elastick Tubes, properly dispos'd and assembled together, for forcing, circulating, and secreting the respective Fluids destin'd thereto. Now as all those several distinct Organs and Machines constitute but one Compound or Whole, it is necessary that they all have a mutual Communication, Subordination and Dependence on each other, and likewise that each single Machine and Organ be constructed of a due Magnitude relatively

relatively to the others, and with a proportional moving Force in its Solids, to fit it for keeping a Ballance with the other Organs and Glands, and for receiving, preparing, secreting, and circulating a certain Portion of the Fluids; which ought for that Purpose to be both of a proper Quantity and Qualities. This Momentum or due Quantity of moving Force, that is proper and requisite for the Solids and Fluids of each particular Organ, Gland, or Machine, I shall call its natural constitutional Quantity of Motion; when therefore all the several Organs have their respective Magnitudes, moving Forces and Quantities of Motion that is natural and constitutional thereto, whereby they will be enabled to maintain a proper Ballance with each other, such an Animal may be conceiv'd to be in a State of perfect Health, having all its Motions duly perform'd, and the Fluids kept duly prepared, repaired, circulated, secreted, and apply'd to their respective Offices.

12. Now supposing any animal Body to be thus happily constituted as above describ'd (which however I believe to be a Case very rarely, if ever to be met with, considering the infinite Casualties and Accidents of Life,) such a Machine can undergo no Change, neither from Health to Sickness, nor from Sickness to Health; but there must be a Change and Alteration produc'd first in its Matter and Motion, or in the natural constitutional Quantity of Motion or moving Force, either of one, or more, or all its several Organs, Glands or Machines.

13. The human Body can't possibly become sensibly affected with any Disease, but either the whole System of the Solids, or some one particular Organ, or more, must first give Way and start from its natural healthful Rectitude. The Fluids I allow have their Diseases both as to their Quantity and Qualities, independent and distinct from those of the Solids; and may happen to be previously indispos'd, and as such will necessarily affect the Solids, but still those Distempers of the Fluids are only to be consider'd as an antecedent Cause, and will not become sensibly felt nor observ'd until it hath actually produc'd some Change, either in the Solids of the whole Body, or of some one, or more, of its Organs, Glands or Muscles; so that the ultimate Effect and Seat of all Diseases, whatever may be the antecedent productive Causes thereof, is to be refer'd to the Solids, which will have their moving Force thereby either rais'd above, or depress'd below their natural constitutional Standard-measure and Quantity.

14. From whence it follows, that all the Diseases incident to this complex Machine the humane Body, are only certain Perturbations or Changes produc'd in this constitutional natural Quantity of Motion, either of one, or more, or all its several Organs; and this Change can only be produc'd by some additional Quantity of Motion, either added to, or subtracted from one, or more, or all the said Organs, whereby they become possess'd with a Quantity of Motion either greater or less, than what is natural and constitutional thereto; from whence Diseases of all Sorts will arise, which, tho' they are all produc'd and owing to this one Cause of too great or too small a Motion in the Solids and Fluids of the whole Body, or some one, or more of its Organs, yet will the same appear diversified with various Phænomena, Phases and Symptoms, as if they were produc'd by Causes specifically different; according as the Change in the natural constitutional Quantity of Motion, happens to be greater or less, or as it affects one, or more, or all the several Organs, Glands, &c.

15. From whence also follows this necessary Conclusion, that as all Diseases of what Kind soever incident to the humane Body, are produc'd from a Quantity of Motion either added to, or subtracted from the whole Body, or some one, or more of its Organs, or from a Change in the Quantity, Qualities, Direction, and Distribution of the Fluids; whereby the natural constitutional Quantity of Motion of one, more, or all the Organs becomes either rais'd above, or depress'd below its proper healthful Standard-Measure, and thereby the just Equilibrium and Ballance of Motion between the several Organs and Machines of the Body perverted and destroy'd; consequently the Cure of all Diseases of what Kind soever consists wholly, and can't possibly be effected any otherwise, but by adding or subtracting Motion to, or from the whole Body, or some one, or more of its Organs, and in regulating the Quantities, Qualities, Determination, and Distribution of the Fluids, until each distinct Organ, Gland and Machine becomes possessed with that Quantity of Motion or moving Force, that is most natural and constitutional thereto, and whereby they will become fitted for the due Performance of their respective Offices, and for maintaining a due Ballance with each other.

16. Now for Exemplification of the foregoing Principles; suppose in the first Place the Solids of the whole Body to be overmuch relax'd from what Causes soever, whereby having lost Part of their natural constitutional moving Force, the Fluids for Want of a proper contractile impulsive Force in the Solids, to attenuate, syringe and circulate the same with a due Impetus and Velocity, must thereupon become crude, acid, indigested and viscid, and thereby dispos'd to form Obstructions throughout the Vessels and Glands, and lay the Foundation for all such Diseases as retain to the chronical Kind; and on the contrary, if the moving Power of the Solids be rais'd above their natural healthful Quantity, in that Case the Fluids being projected and mov'd with too great Celerity, will have their Crasis, Temperament and Texture too much dissolv'd, heated and alcaliz'd, and become productive of acute inflammatory Diseases, &c. Moreover, suppose any one single Organ or Gland of the Body to have its Solids too much relax'd, relatively and comparatively than that of the other Organs, (which I take to be a Case that frequently happens, either from an ori-

ginal wrong Conformation, but most commonly from Errors in the Use of the Non-Naturals) in this Case the Fluids will become necessarily determin'd in a greater Quantity and Velocity upon that Organ or Gland, whereby its natural constitutional moving Force being in part destroy'd, it must of course become diseased, and the Equilibrium or Ballance between it, and the other Organs and Glands, being also in part destroy'd, the other Organs and Members must in Time gradually participate in the same common Fate and become distemper'd likewise, sooner or later, according as the Organ or Gland first affected, is of more or less general Use and Importance to the Body. And the contrary Phænomena, Effects and Symptoms will ensue, supposing the same Organ to have its moving Force rais'd above its healthful Standard-Measure and Pitch.

17. Now the proper Indications of Cure in both the preceding suppos'd contrary States of the Solids are evident, namely, in the first Case the Solids being over-relax'd, and having lost Part of their constitutional natural motive Force, must therefore have a new Quantity of Motion added thereto, by constringing, bracing, condensing, and bringing the constituent Fibrillæ and Machinulæ of the Solids into closer Union and Contact with one another, observing to take away the Cause of their Relaxation and Disunion, or to change the Modus and Manner of its operating. But in the second Case, the Solids having too great a moving Force, require to have a Quantity of Motion subtracted therefrom, by relaxing, unbending and setting their compounding Fibrillæ at a greater Distance from each other, and removing the Cause of their too great Tension, Rigidity and Stricture, or changing its Manner of operating. So that as the Diseases in the first Case proceed from too small a Momentum and moving Force in the Solids, so the Cure consists in adding Motion thereto. And in the second Case, as the Disease proceeds from too great a motive Force in the Solids, consequently the true Indication and Intention of Cure must be to subtract Motion therefrom, by lowering and taking down their too great Stricture, Springiness and Elasticity; and so in all other Cases. Whence it is manifest, that in the Cure of all Diseases the general Intentions may all be refer'd to this one alone, of adding or subtracting Motion, to or from the whole Body, or some one, or more of its Organs and Glands; and in regulating the Quantity, Qualities, Direction, and Distribution of the Fluids, until that all the several Parts and Organs are restor'd to their natural healthful Quantity of Motion, and a perfect Ballance and Harmony establish'd between them.

18. Now in order farther to establish the Truth of the foregoing Principles, it will be sufficient for that Purpose to shew, that all the primary distinct morbid Constitutions of the animal Solids and Fluids, or which comes to the same Thing, that all the general Intentions which Physicians propose and take for the Cure of Diseases, may be reduc'd to the foregoing one; now those general distinct specifick Diseases of the Solids and Fluids, or the general Indications of Cure, as the same are consider'd by Physicians, may all be reduc'd to the seven Divisions following.

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| 1. Constriction and Relaxation | } of the Solids. |
| 2. Stimulation and Pacification | |
| 3. Solution and Reunion of the Solids; this Division belongs more properly to the Province of Surgery. | |
| 4. Augmentation and Diminution of the Secretions | } of the Fluids. |
| 5. Rarefaction and Condensation, or Heating and Cooling | |
| 6. Derivation and Revulsion | |
| 7. Solution and Inspissation | |

19. Now all the foregoing general morbid Constitutions and Diseases, plainly imply Motion to be either wanting, or abounding in the Solids and Fluids of the whole Body, or of some one, or more of its Organs, and consequently all the Indications for curing the foresaid general Diseases, plainly point out a Necessity of adding, or subtracting Motion to, or from the Solids and Fluids, until that the lost Ballance and Equilibrium between the several Organs and Glands is restored; from whence it is evident, that in all the morbid Affections and Diseases incident to Mankind, the constitutional natural moving Force of the Solids, is either rais'd above, or depress'd below its healthful Standard-Measure, and that either in all, or some one, or more of the Organs of the Body; and consequently in the Cure of all Diseases, be they of what Kind soever, or produc'd from what Causes soever, this must be the only true ultimate final Intention for curing the same, either by adding, or subtracting Motion to, or from the whole Body, or some of its Organs; and in regulating the Quantities, Qualities, Direction, and Distribution of the Fluids, until the several Organs and Glands become restor'd to their healthful constitutional Quantity of Motion, and to maintain a mutual Ballance with each other, in which alone consists the Definition and Idea of perfect Health, observing either to take away the Cause of the Disease, or change its Modus of operating.

20. The Truth of the foregoing Principles is further manifest from what must be the last Resolution and Practice of every Physician, who after having taken all the proper Means to inform himself rightly of the Nature of the Disease, with its Cause or Causes, (concerning which he will be always best instructed to form the most certain Judgment from a diligent Observation of the Symptoms, &c.) he must still at last come to this ultimate Judgment and Resolution, that some Change or Alteration is necessary to be produc'd either in the Solids or Fluids of the whole Body, or only of some one, or more of its several Organs and Glands. Now this Alteration or Change being resolv'd upon, be what it will, and let the Means and Medicines made use of to effect it be what

what they will, the same can only be brought about by producing some Motion in the Solids and Fluids either of the whole Body, or of some of its Parts only, and in regulating the Quantity, Qualities, and Determination of the Fluids, so as to cause their Effects to become manifested either outwardly upon the cutaneous Glands, or inwardly upon those of the Stomach and Intestines, or upon the renal, or salival Glands, &c. according as the Symptoms indicate.

21. Having shewn that Health consists in a just Equilibrium between the moving Forces of the several Organs, Glands, &c. of the Body, and that Diseases are only certain Perturbations or Changes in this just Ballance of Motion between the respective Organs of the Body, consider'd either as they affect all, or only some of the said Organs. Let us next consider by what Causes this nice Ballance of animal Motion and Health, becomes most commonly and principally affected, for by knowing the general productive Causes of Diseases, we shall be the better able for to remedy and prevent their ill Effects; now what those Causes are will be best understood from considering what are the general Causes, Principles and Instruments ordained by Nature, as absolutely necessary to the Preservation and Continuance of animal Life and Health.

22. The humane Body consisting of an Assemblage of contractile distensible Tubes, infinite in Number, and in the Manner of their Disposition, Arrangement, Convolution, Curvature, &c. fill'd with Fluids, subject to great Degrees of Rarefaction and Condensation; may be consider'd as a true and real Machine, form'd upon the most perfect Principles of Geometry, Mechanicks, Hydraulicks, Pneumatics, &c. at first form'd and put into Motion by God, and continued in Motion for a certain Period of Time by the continual Influence of the same Almighty creating Power, operating thereupon through and by means of certain general Principles, Causes and Instruments, which are as follows, being all that are necessary to the Continuance of animal Life and Health.

23. First, Solid and Fluid, Aliment or Water; to repair the Waste and Expence of the animal Solids and Fluids.

24. Secondly, Air, and elementary Fire or Heat; which by their Fluidity, Gravity, Pressure, Elasticity, Stimulation, Motion, Heat, Cold, &c. serve to sustain, brace and keep the whole System of the Solids and Fluids together, and give them Liberty to grow, expand and develope gradually; and by their said ever variable Properties and Qualities, serve as a perpetual Stimulus and Principle for communicating and substracting Motion to, and from the animal Machine, successively and alternately.

25. Thirdly, Motion or Exercise; which together with the Passions, serve as another principal Cause and Stimulus for communicating and substracting Motion to and from the Body; interchangeably with Rest, to give Time to the Solids to have their Decays repair'd by the Apposition of proper nutritious Matter.

26. By a due Use and Application of the foresaid general Principles, the animal Machine will have its natural and vital Motions regularly perform'd, and prolong'd to the utmost it was made for to last, by virtue of its original Structure and Composition.

27. From a wrong Use and Application of the foresaid general Principles it is, that the regular natural Motions of the Body become perverted, and Diseases of all Sorts introduc'd. That all the Diseases incident to Mankind (excepting such as are casual, or owing to an original wrong Conformation, or hereditary Weakness impress'd upon the first Elementary Stamina of the animal Machine, which are Cases that come not within the Consideration and Province of Physick; as being absolutely incurable) do necessarily proceed from a wrong Regimen as to the foresaid Non-Naturals, is what may be laid down as a fundamental Rule and Maxim in Physick, and thus we find the greatest Physicians in all Ages, but more especially the Antients, making the foresaid cardinal Catholick Subjects, namely, Aliment, Air, Water, and Exercise, the whole of their Study, and the sole *Materia Medica* and Foundation of their Practice, applying themselves diligently to acquire a true Knowledge of the same, but more especially of the Air, and the different Constitutions and States thereof in the several Seasons of the Year, with the mechanical Effects thereof upon animal Bodies, which they found to be of such universal great Influence, that the renown'd *Hippocrates* was used to say, that the different States of the Air and Seasons of the Year, was the true general Parent and productive Cause of all or most Diseases.

28. Now to demonstrate the Truth of this fundamental physical Aphorism, namely, that the Air is the principal Cause of all, or most Diseases, it will be sufficient for that Purpose to consider the mechanical Operation and Effects, with the universal Influence which it hath upon all Parts both external and internal of the human Body; to this End therefore we are to consider the Air as continually apply'd and operating upon the Body by four different distinct Ways as follows.

29. First, the Air has a constant general Action and Influence upon the whole external Body, which being compos'd of an Assemblage of elastick Tubes, fill'd with Fluids subject to be greatly rarefied and condens'd, and being constantly immerg'd into this fluid Medium the Air, which is ever changing in respect to all its Properties and Qualities, of Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, Motion, Rest, Effluvia, &c. upon all which Accounts it becomes a perpetual Cause and Instrument for communicating Motion and Exercise to the Bodies of Animals and Vegetables, which become thereby kept in a continual fluxionary State of ebbing and flowing, contracting and dilating, heating and cooling, &c. and the Atmosphere being subject to constant,
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and oftentimes great and sudden Mutations, from one Extream to another, by which Means the Air maintains a universal great Influence over the Ballance of Life, by determining it either to the Side of Health, or Sicknes; according as its Properties and Qualities happen to be relatively, well or ill proportioned to the constitutional State of the Body, as will be shewn more particularly in the second Chapter.

30. Secondly, the Air is applied and operates constantly and alternately with all its variable Properties and Qualities upon the whole animal Fluids, which are continually and successively subjected to its changeable Operation and Effects, by the joint Mediation and Mechanism of the Lungs; and here in this complex Organ the mechanical Effects of the Air are most remarkably and signally display'd and manifested, and by which general Operation upon the whole circulating Fluids, it becomes the primary Cause and Instrument both of Health and Diseases; according as its Properties and Qualities happen to be relatively well or ill proportioned to the constitutional State and Structure of the respiring Organs; as is shewn more fully in the third Chapter.

31. Thirdly, the Air has moreover a very great and important Use and Operation within the primary concoctive Gland the Stomach, with its Appendage the whole intestinal Tube, which is the true and real Root of the whole Body, to which it bears the same Relation as the Root of a Tree does to the Trunk and Branches. And as the internal Surface of the alimentary Tube from the Mouth quite to the Anus, is to be consider'd as a real Part of the external Surface of the Body, consequently the mechanical Effects of the Air within and upon the said Alimentary Tube, will be like an Analogous (allowing for some Differences) with what they are upon the external Trunk of the Body; or much rather to what they are upon the Lungs (the internal Area of which Organ, being also a real Part of the external Area of the Body) this Organ and the compound Alimentary Tube, by means of the Diaphragm and abdominal Muscles, having an alternate Motion of Systole and Diastole at the same Time; the Air within the Alimentary Tube being alternately condens'd and rarefied, at each Act of Expiration and Inspiration of the Lungs, whereby it serves to attenuate and dissolve the Texture of the Food, and to propel and forward its Motion through the lacteal Vessels and thoracick Duct to the Heart and Lungs, to be farther elaborated and sanguified, &c. And here again the Air from its good or bad Effects within this compound Alimentary Tube acquires an universal Command and Influence over animal Health and Diseases; according as it happens to be well or ill proportioned in Quantity and Qualities, to the constitutional State and Structure of this complex Organ the Stomach and Intestines; as will be found more particularly describ'd in the seventh Chapter.

32. Fourthly, as all the animal Fluids are fully saturated and absorb'd with elementary Air and Fire; as the Atmosphere undergoes any Change in its Gravity, Elasticity, Pressure, Heat, Cold, &c. This internal absorb'd Air and Fire, arrested within the Pores and Interstices of the Fluids, will suffer a like Change, and by endeavouring to maintain a Ballance with the external elementary Air and Fire, the whole solid vascular System, with the contained Fluids, will by the Action of those two variable antagonist Powers, the external and internal Air, with the external and internal elementary Fire, become subject to a perpetual State of Motion, Oscillation and Exercise; being thereby kept always contracting or dilating; condensing or rarefying; heating or cooling, &c. by virtue of which constant universal Action of the internal Air upon the whole System of the Fluids, and by necessary Consent upon the whole System of the Solids likewise, the Air acquires a still farther universal Empire and Influence over the Life, Health and Diseases of Animals, as it happens to be relatively well or ill proportioned, in its Quantity or Qualities, to the State and Constitution of the Solids and Fluids; as may be found farther explained in the third Chapter.

33. We see then how our Bodies are in every Part, both Solids and Fluids, internally and externally, and at all Times, subject to the absolute Dominion and Influence of this most active subtil variable Fluid the Air, which having so intimate a Union with all the Fluids, and such universal Access and Operation upon the whole System of the Solids and Fluids; that it may be establish'd for a physical Maxim and Aphorism of eternal Truth; that the Air, including its four general mechanical Operations upon the Body, (as describ'd in the last four preceding Numbers) is the principal most general Cause and Instrument that presides over animal and vegetable Life, and by which all that relates to the Preservation of Health, and also to the Production and Cure of Diseases, in a Manner wholly depends.

34. Thus then we see that the true general productive Causes of all Diseases are Air, Aliment, elementary Fire, Motion, and Rest, with the Passions, among which the Air is confessedly allow'd by all to be the principal and most general Cause, as it necessarily must, considering its fourfold universal Operation upon the Body. When therefore the Air is the Cause of any Disease, from any of its four Ways of operating upon the Body, by reason of its being relatively disproportionate in its Properties, Qualities, or Quantity, to the constitutional State either of the whole external Body, or to the State and Structure of the Lungs, or alimentary Tube; and likewise of the Fluids; in all such Cases when the Disease is produc'd from the disproportionate Operation and Effects of the Air, in any of the said four Respects; it will be absolutely impossible and in vain to expect a perfect safe lasting Cure, by any other Means or Medicines in Nature, but from the Air itself alone, by changing it for another Air, that is endow'd with Properties and Qualities opposite and contrary to those by which the Disease was produc'd; now to illustrate the Truth hereof shall produce

duce the following Case: Suppose then the Air of any Place to be comparatively light, humid, warm, &c. such a State of Air, by any of its four general Ways of operating, either upon the whole external Body, or upon the respiring Organs, or upon the alimentary Tube, and chylo-poietick Organs; as also within the animal Fluids, (as has been briefly explained already in the foregoing Numbers) will naturally and necessarily produce a general Relaxation of the Solids, with a Viscidity of the Fluids, and a general Resistance and Obstruction throughout the several Series of Vessels and Glands, whence will ensue, Tumors, Consumptions, Atrophies, Asthmas, Agues, Dropsies, Cachexies, Scurvies, Hysteric and Hypochondriac Affections, Palsies, Cholic, &c. with all the long Train of Diseases that retain to the chronical Kind. This being granted, when therefore such a State of Air as above-mentioned is the true Cause of the Diseases here suppos'd, the true and only perfect Cure is for to change it for an Air that is endow'd with contrary Properties and Qualities, namely, for an Air that is relatively heavy, dry, serene and moderately cold; which Change of Air may be had by going into some other Place or Country, where the Air for ordinary is possess'd with those Properties and Qualities; or such a Change of Air may be obtain'd by Art, without being oblig'd to change ones Habitation or Residence for that Purpose, as I shall show in the following Essay. Now when the Air is either the sole Cause of any Disease, or has the principal Share and Agency in producing the same, as it always will in most Diseases, it would be absolutely in vain to attempt the Cure by any other Means or Medicines in Nature, but by a Change of Air; for whatever Relief or Reprieve any other Means or Medicines would procure to a Person in this Case, without changing the Air, would be only palliative, deceitful and fugitive; for as long as the original productive Cause subsists, and continues to act, the Disease which is the Effect of that Cause, can never be perfectly subdued, but will return again with fresh Vigour. The Case being exactly the same as to attempt the Cure of a Dropsy by purging, salivating, sweating, blistering, tapping, &c. for tho' the Waters may be carry'd off and kept under for some Time by those Means, yet so long as the renal Glands continue obstructed, or otherwise incapacitated for the due Performance of their Office, which is the principal and immediate Cause and Seat of this Distemper, it will be impossible ever to effect a perfect lasting Cure, without removing and taking away the Cause thereof, by restoring the renal Glands to their natural constitutional moving Force, &c.

35. However in the foregoing Number we have suppos'd the Air, by any one of its four general Ways of operating upon the Body, as sufficient of itself alone to produce all Diseases, yet this is not to be understood, so as to exclude all the other general Causes, namely, Aliment, Exercise, and the Passions; any one of which alone are likewise capable of producing all the same Diseases, all that is meant here, is, that the Air is for ordinary the most common general Cause, or at least has the greatest Share and Instrumentality therein. But let the Disease be produc'd either from Air, Aliment, Exercise, or the Passions; separately, or jointly; there is but one true general Intention of Cure; and that is, to remove and take away the Cause of the Disease, or change its Modus and Manner of acting; and thus if the Disease be occasion'd from Errors as to Aliment of any Kind, either in Quantity or Quality, it must be chang'd for Aliment with contrary Properties; and if the Disease be the Effect of too much, or too little Motion and Exercise, the same must be chang'd and varied accordingly. And if the Disease be owing to any predominant Passion, or to a State of Indolence and Inaction, the same must be govern'd and regulated accordingly; and when any two, three, or all the said four general Causes concur, and are jointly concern'd in the Production of any Disease, Regard must be had to change and regulate all the several co-operating Causes accordingly, &c.

36. The Cure of all Diseases, be they of what Kind soever, can only be truly and perfectly effected, either by removing the Cause of the Disease wholly, or in changing its Modus or Manner of Operating, by causing it to act with Properties and Qualities contrary to those by which the Disease was produced. And as all Diseases are produced from Aliment, Air, Exercise, and the Passions, consequently they only are the true, perfect, natural, general Means and Remedies for the Cure of all Diseases: The Truth of which Position is sufficiently establish'd and warranted from the two old received Maxims, namely, *Sublatâ vel mutatâ Causâ, & tollitur vel mutatur Effectus*. And Diseases are always to be cured by Causes, contrary to those by which they were produced. And this appears to be the Judgment of all good Physicians, who place their whole Practice and *Materia Medica* chiefly in the four general Means aforesaid, and in which they will always find the greatest Success and Safety, with all that is necessary to obtain Health, Long Life, with the Cure of all Diseases. And thus we find them in most Cases advising their Patients to a free Use and Change of Air, upon a well grounded Presumption, and which seldom misses, That the Air of the Place is the principal Instrument and Cause of the Distemper; but where to find a proper Change either of Air, Aliment, or Exercise, and to know what Properties and Qualities the same should have, in order to suit and agree the best with the Intentions of Cure, and the constitutional State of each Person; (*hic Labor, hoc Opus est*) and herein the diligent and learned Physician will have a fair Opportunity of distinguishing himself from Nominal, Pseudo-Physicians and Empiricks, by his extensive superior Knowledge of the Animal Œconomy, and the true Nature of Diseases, with the Physiology of the Air, Aliment, Exercise, and how for to apply the said Catholick Principles and Remedies of Nature's Institu-

tion properly, so as to make them answer the general good Ends for which they were ordain'd, namely, the Preservation of Health, with the Cure of all Diseases.

37. As Aliment, Air, Exercise, with the Passions, are the true and only Causes of all Diseases, they become of Consequence the true and only perfect Means and Remedies for Curing the same; and from hence it follows also, That all other Means or Medicines besides those Catholick Remedies of Nature's Appointment, are not only vain and useless, but really prejudicial and destructive of Health, especially all such as are derived from the fossil Kingdom, and are only the Produce and Manufacture of intense, artificial Fire, &c.

38. The Mechanical Operation and Effects of all Means or Medicines, either for Preserving Health, or the Cure of Diseases, consists altogether in the Quantity of Motion which they are capable to add to, or subtract from the animal Solids, and in Regulating the Quantity, Qualities and Distribution of the Fluids, so as to produce a just Equilibrium throughout the whole Machine and all its Parts, by keeping the moving Force of the Solids duly proportioned to the Resistance and Reaction of the Fluids. Thus, for Instance, among the Remedies now in Practice, those of the most noted universal Virtue and Efficacy are Emeticks; now the Intention, real Operation and Effects of all Medicines belonging to this Class, may be all properly consider'd as a particular Way of exercising or communicating a new and unusual Quantity of Motion to the whole System of the Solids and Fluids; by first producing an extraordinary Stimulation and Motion in the Stomach, which by the strong Effort which it makes to disengage itself from this uneasy, ungrateful Stimulation, (by necessary Consent and Connexion, this compound Organ with its Appendage the Intestines, being the true and real Root of the whole Body) brings the entire System of the Solids and Fluids into a State of violent Motion and Exercise for a Time, by which universal strong Efforts the Body becomes greatly agitated, convulsed, and has a great Quantity of Motion communicated thereto during the Operation of the Medicine, by which frequent strong Contractions and Vibrations thus excited in the Solids, they will be enabled to shake off and expel any foreign Particles as may have insinuated themselves into their Pores and Interstices, and thereby relaxing and clogging their Springs; and if there be any degree of Lentor or Viscidity in the Fluids the same will become dissolv'd, and Obstructions in the several Series of Vessels, Viscera and Glands remov'd, and most of the Secretions increas'd, &c. Now all those salutary good Effects are wholly owing to the great additional Quantity of Motion that is thus communicated to the animal Solids and Fluids, and not to any transforming Virtues or occult specifick Qualities or Powers in the Medicine itself; for could the Body be put into such a State of Motion and Exercise without taking any Medicine at all internally, the very same salutary good Effects would be produced, as is manifest from the universal great Efficacy of Bathing, the whole Effects whereof consists in its Pressure and in the great Quantity of Motion and Exercise which the Body receives during the Operation, &c. And the same general Observation and Reasoning is equally true and applicable to Opiates, which by exciting a grateful placid Stimulus and Sensation in the Stomach, &c. brings on a general Relaxation throughout the Solids and nervous System, and thereby disposes the Body to a State of Rest, Inaction and Indolence. The same general Remark is equally true as to all other Remedies and Means of healing of what Kind soever, such as Catharticks, Diureticks, Sudorificks, Salivaticks, Epispasticks, Bathing, Frictions, Causticks, Cauteries, Venesection, Odontalgicks, Ophthalmicks, Sternutatories, Exercise of all Kinds, &c. All which several Kinds of Remedies are only intended and have no other Effect or Use than to communicate Motion more or less, either to the Solids and Fluids of the whole Body, or only of some one, or more of its Organs or Members; and for directing and regulating the Quantity, Qualities and just Distribution of the Fluids, so as to cause them to manifest their Effects either upon the intestinal, renal, salival, cutaneous Glands, &c. And from hence it is manifest, that all Diseases may be refer'd to this one general Head of too great, or too small a Quantity of Motion in the Solids and Fluids; and consequently all the Intentions of healing, with the whole mechanical Operation and Effect of all Means and Medicines may be reduc'd to this general one alone, of regulating the Quantity of Motion in the Solids and Fluids, by adding or subtracting, until all the several Organs and Glands are possess'd with their natural constitutional Quantity of Motion, by which alone they will become enabled to perform their respective Offices duly, and to maintain a just Ballance with each other, wherein alone consists the Essence and Definition of perfect Health.

39. The Powers and Virtues of all Medicines and Means of healing (by what Names or Titles soever dignified) whereby they become capable of adding or subtracting Motion to, or from the animal Machine, and in regulating the Quantity, Qualities, Direction and Distribution of the Fluids, consists wholly in the mechanical Properties and Qualities wherewith they are endow'd, namely, their Fluidity, Gravity, Elasticity, Pressure, Momentum, Attraction, Heat, Cold, Stimulation, Humidity, Dryness, &c. and whereas all those Properties and Qualities are to be found most eminently in those five cardinal Principles, namely, Aliment, Water, Fire, Air, and Exercise, consequently whatever Alterations or Intentions can be produc'd by any other Means or Remedies by virtue of the above mechanical Properties and Qualities, the same may be much more certainly, safely and perfectly effected by proper Methods of applying the said four Catholick Principles, appointed by Providence as the chief Instruments and Causes of animal Life, Health and Diseases.

40. From what has been said it follows, that the most perfect, safe, expeditious Method for the

the Cure of Diseases, must be that whereby Motion in all Quantities and Degrees, can be most expeditiously, safely and universally communicated to or substracted from the Solids and Fluids of the whole Body, or of some particular Region, Gland, or Organ thereof; and by which the Quantity, Qualities and Distribution of the circulating Fluids, can be best govern'd and regulated.

41. The foregoing Observations and Reasoning being allow'd for just, I shall from thence deduce the following general Proposition, the several Cases whereof, with their Solution, Use and Application, serves as the Basis of the new Methods for preserving Health, and curing Diseases, as describ'd in the following practical Essay.

P R O P O S I T I O N I.

42. The most perfect, safe, expeditious, universal Method for communicating and substracting Motion in all Quantities and Degrees to and from the Solids and Fluids of the humane Body, and for regulating the Quantity, Qualities, with the Direction and Distribution of the Fluids; is by applying a proper Quantity of Pressure, &c. either to the whole external Body and its several Parts, or to the Lungs, by means of some Fluid, either Air, or Water, &c.

43. For Proof of this capital Proposition, I need only appeal to the Condu&t and Method instituted by Providence for the Continuance of animal Life, having for this Purpose appointed the Air, which by its operating with a continual and variable Quantity of Pressure, &c. upon the whole Body, together with its other changeable Properties and Qualities, serves as a perpetual active Principle for communicating Motion and Exercise to the whole animal System, by which Means it becomes the general Agent, Instrument and Cause that presides over animal Life, Health and Diseases. As is shewn farther in the second Chapter.

44. Nature, which is always the most perfect Original to imitate and copy after, instructs us farther as to the Truth of the foregoing Proposition, that a Machine consisting of a System of elastick compressible Vessels, fill'd with Fluids, capable of Condensation and Rarefaction, such as is the humane Body, and likewise the Lungs, that the most perfect Method for continuing such a Machine in a State of Health and Motion, is by applying an elastick Fluid, such as the Air thereto, and causing it to operate thereupon, with a continual variable Degree of Weight and Pressure, &c. of which we are furnished with an admirable beautiful Instance in the compound Operation and Mechanism of the Lungs and Air, how that by the alternate variable Pressure of the Air upon the Blood, as it circulates successively through the System of the pulmonary Vessels, the Fluids are thereby kept strongly moved, triturated, mix'd, sanguified and prepared for the several Offices of the animal Œconomy. As is farther explain'd in the second and third Chapters.

45. That Pressure when thus apply'd by an elastick Fluid as the Air, and that in a proper Quantity, and equable universal Manner to a compressible vascular Machine such as the humane Body, is capable of producing the greatest and most important Changes both in the Solids and Fluids, and that in the most perfect, expeditious, effectual and universal Manner, is a Truth easily demonstrable from the Structure of the humane Body, and the Principles of animal Mechanism, with the establish'd Laws of Motion, Impulse, Percussion, and the Pressure of Fluids moving in elastick Tubes, with the Laws relating to the Communication of Motion, &c. But the Truth of the foregoing capital Proposition we have fully confirmed from daily Experience and Facts, which in Cases of this Nature is always the best Rule to judge and go by; and that is from what we may daily observe from the Effects of Bathing, by a judicious Application whereof many Diseases receive a perfect Cure, which could never have been effected by any other Remedies; now this great Efficacy of the Bath, whereby it produces those many and great Cures, is principally owing to the Weight and Pressure of the Water, together with the Stimulus arising from its Cold or Heat, whereby the whole animal Machine becomes subjected to a universal Compression and Contraction, and having a great additional Quantity of Pressure and Motion communicated thereto during the Operation, the whole solid vascular System being put under a general Effort, Squeeze and Struggle, and being made to oscillate and vibrate strongly and quickly, Obstructions in the Vessels and Glands will become thereby remov'd, and the Lensor of the Fluids dissolved, and the same render'd better fitted for their respective Offices, &c.

46. For farther Proof of the foregoing Catholick Proposition, namely, that Pressure when apply'd by means of a Fluid, either Air or Water, to the humane Body, in a proper Quantity, for a requisite Time, and at due Intervals, is capable of effecting the greatest and most notable Alterations in the Solids and Fluids. It will be sufficient for this Purpose only to consider the Structure of the Body, which being compos'd of an Assemblage of elastick, contractile, distractile Vessels, fill'd with compressible Fluids, whensoever any additional Pressure is laid thereupon, either by means of Water or Air, (but more especially by Air, which being the natural Element to which the Body is ever accustomed, will answer this Intention much better and more universally than Water, except in some particular Cases) the Effects of that Pressure will be communicated and propagated instantaneously throughout the whole animal System, in such wise that every the smallest solid Fiber, with the most minute evanescent capillary Tube, with the contain'd Fluids, will feel the Influence thereof and become sensibly affected and contracted thereby; and again upon taking off this additional Pressure from the Body, the whole solid vascular System by its intrinsic resti-

tutive Force will expand and dilate, and both the Solids and Fluids undergoing an universal Diastole, the Body will become increas'd in its Bulk and Dimensions. And after this Manner the whole Body may be made to oscillate and vibrate successively, from the Surface of the Body to its Axis, and from the Axis outwards to its Surface, and that for as long a Time as requir'd, &c.

47. Moreover a variable Degree and Quantity of Pressure, communicated by an elastick Fluid, as the Air, is absolutely necessary to all Degrees of Animal and Vegetable Life, and as Animals differ considerably in their Solids and Fluids, they require a different Quantity of Pressure, and thus Fish having their Solids more lax and less cohering and firm, and their Fluids more gross and viscid, require a greater Pressure to be laid upon their Bodies, than Land Animals, whose Bodies are of a firmer Composition; for which Reason they are fitted for living under Water, whereby they become Subject to the Pressure of both Elements, and by going to greater or less Depths in the Water, they can at Pleasure greatly alter the Quantity of Pressure upon their Bodies, which Land Animals can't do, except it be the winged Race, that can mount aloft to great Heights in the Air.

48. As the Air is allowed by all to be the most universal Cause and Instrument of Health and Diseases, as will plainly appear from what has been said, compared with the other Parts of this Essay; suppose now a Person had it in his Power for to change that Part or Portion of the Atmosphere immediately encompassing his Body, whensoever he pleas'd, and wheresoever he went; so as to cause it to operate (independently of the general Atmosphere) both upon his whole external Body, and likewise upon his Lungs; with all its Properties and Qualities so changed and adjusted as suits and agrees best with the present State and Constitution of his Body, and respiring Organs; such a Person would thereby become effectually secur'd from all the Diseases which he would otherwise have been subject to, from the variable Influence and Effects of the general Atmosphere. Thus, for Example, suppose the general Atmosphere to undergo a sudden Change with Respect to any of its Properties and Qualities, as from being extreamly heavy, to become extreamly light, now such a Change in this one Property of the Air alone, if continued long, is sufficient to subject the human Body to many and great Diseases, by relaxing all the Solids, and giving Liberty to the Fluids to rarify and expand too much; from all which morbid Impressions, the Person here supposed will become effectually secured, by causing or commanding his artificial portable Atmosphere to operate with such a Degree of Pressure upon his Body, as he finds suits best with the State of his Solids and Fluids. Again, suppose the general Atmosphere to become of a sudden extreamly hot, damp, and light withal, in this Case it will have a much greater and more general Influence in the Production of Diseases, but still this Person with his artificial travelling Atmosphere, will be unaffected, and Proof against all those or any other Alterations that fall out in the general Atmosphere, by causing this his artificial Atmosphere to operate with such a Degree of Heat, Dryness, and Pressure, as suits best with the present constitutional State of his Body; and so for all other Changes, Alternations, and Combinations, that can any wise happen in the Properties and Qualities of the general Atmosphere, this portable partial Atmosphere, like to a Coat of Armour, affording him a sure Relief and Sanctuary against all such morbid Impressions from the Air.

49. In the several States of the Atmosphere, as supposed in the foregoing Number, the Influence of the Air has been understood as applied and operating only upon the external Body, by its Effects upon which alone, all Manner of Diseases may be produced, but if we consider the mechanical Effects of the same States of the Atmosphere, as above suppos'd, when apply'd to the Lungs, in that Case we shall find them to have still a much greater universal Influence in the Production of Diseases of all Sorts, which, however, the Person with this his travelling artificial Atmosphere may secure himself entirely from, by causing the same to operate with its Properties and Qualities so regulated combin'd and adjusted, as suits best with the present constitutional State of his respiring Organs.

50. A Person provided and arm'd with such a magick artificial Atmosphere, subject to be changed in all Respects at his Pleasure, may bid Defiance to all the Mutations that happen in the general Atmosphere, for as much as let the State thereof be what it will, heavy or light; dense or rare; hot or cold; wet or dry; in Motion or at Rest; impregnated with Vapours and Effluvia of any Kind, or not, &c. if he either actually finds or apprehends any ill Effects therefrom, he can fit and prepare his portable artificial Atmosphere or Shell of Air, with contrary Properties and Qualities, and that in all Degrees, Combinations, and Proportions, as agrees best with the present State both of his Body and respiring Organs; whereby he will become effectually secured against the malignant Influence, or the relatively disproportionate Operation and Effects thereof, to which general Cause alone, most Diseases, as well particular as endemick, and epidemick, are wholly owing.

51. However the foregoing supposed Case of having the general Atmosphere, or such a Part thereof as surrounds our Bodies, subject to have its Properties and Qualities changed at the Will and Command of every Person, is impossible; yet, nevertheless, by proper Machines, it may be render'd so; this Consideration, therefore, furnished me with the first Hint and Occasion of thinking of a proper Machine and Apparatus for solving this most useful Problem, whereby an artificial Atmosphere may be at all Times, and for any Space of Time, and in all Places, constructed

structed and prepar'd, with its Properties and Qualities so regulated, adjusted and proportion'd in all Degrees and Respects, as shall fit and agree best with the constitutional State and Structure both of the Body and respiring Organs of every individual Person ; and likewise as shall suit and answer best for effecting all the general Intentions that can be propos'd for the Cure of all Diseases, &c.

52. It has been already observ'd, that the Health and Diseases of the Body depends chiefly upon the Solids, which are always necessarily affected in all Distempers ; and for ordinary, all Diseases make their first Attacks upon the Solids, and gain Access and Entrance that way. Now the principal morbid Affections of the Solids are, their being either too tense, elastick and contracted, or over much relaxed ; or in having too great, or too small a moving Force. And as the Air with all its Properties and Qualities has such universal Access and Influence over all the Solids, it becomes the principal Cause whereby the said two opposite morbid States of the Solids are brought about. Thus, if the Air prove to be light, warm, humid, &c. the Solids will become relaxed by the Humidity and Warmth of the Air ; and for want of a proper Degree of Pressure in the Air to sustain them outwardly, they will yield and become distended by the Fluids, which will become rarified and expanded at the same Time, and by the same Causes ; whereupon the Solids will become relaxed, by having their compounding Fibrillæ set at too great a Distance asunder, whereby the Force of Cohesion between them being diminished, their Elasticity and moving Force will also become weakned proportionally. And again, when the Air happens to be possessed with the contrary Qualities, and proves heavy, dry, cold, &c. the Solids and Fluids will be affected in a contrary manner to what they were in the former supposed Case. The Solids being brought into closer Union and Contact, will become strengthened, and have their Elasticity and motive Force increas'd, and the Fluids be condens'd at the same Time, and by the same Causes. Now a Person, by having a proper Machine or artificial Atmosphere wherein to inclose his Body, and by causing this artificial Atmosphere to operate upon his Body and Lungs, for any reasonable Time, with its Properties and Qualities intended or remitted, regulated and adjusted in all Degrees, Proportions and Combinations as suits best, he will become thereby furnished with the most effectual, perfect, safe, universal Method, for obtaining those two primary Intentions, which virtually include the whole Practice of Physick, namely, of contracting, bracing and raising the moving Force of the Solids, when too languid and depressed, or of relaxing and diminishing their motive Force, when raised too high. Such an artificial Atmosphere being a real fluid Mold, by which a Person may new mold and fashion his Body at Pleasure, and keep the Springs of his Solids most perfectly wound up to what Pitch he pleases, in like manner as putting his Wig in Buckle.

53. From the foregoing Observations and Reasoning, I shall advance this other general Proposition for a certain physical Aphorism and demonstrable Truth, upon which a new and more perfect Practice may be established for the Preservation of Health, and the Cure of Diseases.

P R O P O S I T I O N II.

54. All the general Intentions requisite either for preserving Health, or curing Diseases, (as enumerated in Number 18.) may be effected in the most perfect, safe, expeditious, universal Manner, by submitting the human Body for a reasonable Space of Time, and at due Intervals, to a proper additional Quantity of Pressure, either by means of Air or Water ; join'd and assisted with their other mechanical Properties and Qualities, of Gravity, Elasticity, Heat, Cold, Stimulation, Motion, Attraction, Humidity, Dryness, Effluvia, &c. applied to the Body and Lungs, in such Degrees, Proportions, and Combinations, as will agree best with the constitutional State and Structure of the Body, and respiring Organs, and for promoting the several Indications, &c.

55. As the mechanical Methods for preserving Health, and the Cure of Diseases, here only described in general, but explained more particularly under the proper Heads in the following Treatise, are entirely new and uncommon, I am sensible the same will afford copious Matter for such Persons to display their Talents, whose Genius and Faculties are turned for Raillery, Sneer and Ridicule ; and who having nothing from their own Fund and Invention to offer worthy the Attention of the Publick, are ever prepared to censure and depreciate the Performances of others. However, to obviate what Objections may either arise from such Persons, or others of a more serious Cast and Disposition ; I will only produce one Case out of the many that might be cited, which being duly stated, consider'd and determin'd, will fully open up the Design, Necessity, and Usefulness of the new Methods of curing Diseases described in this Treatise.

56. For this Purpose, I will suppose a Person affected either with an Asthma or Consumption, I will suppose farther, that the true original Cause of this Disease, as it regards this particular Person, to be produced wholly from some one or more of the Properties and Qualities of the Air, either from its Gravity, Elasticity, Pressure, Heat, Cold, Moisture, Dryness, Effluvia, &c. operating with a Momentum and Force relatively disproportionate to this Person's respiring Organs ; that the foresaid Diseases (when not hereditary, or proceeding from a Male-Conformation of the Parts) is most commonly produced from the disproportionate Influence of the Air, as here supposed, is what every good Physician will readily allow.

57. Now the Case being thus particularly stated, the present Practice of Physick furnishes us only with two general Methods of Cure in the above Cases. The first Method directs the Patient to go into some other Country where the Air is suppos'd to be endow'd with different Qualities. This Method, though much the most rational and perfect of the two, is however so very circumscribed and limited, as to be of little Use: First, as there are but few Persons whose Circumstances and Condition of Life will admit of changing their Habitation: And secondly, this Method, when it can be complied with, yet labours under this invincible Difficulty and Uncertainty, as it is scarce possible to know, *a priori*, where to find a Place, the Air whereof shall have the Properties requisite for such a Person's Case. As this first Method can seldom be complied with and put in Practice, Physicians are forced to have Recourse for Ordinary to the second general Method, and that is, to endeavour to attack and conquer the Distemper by the whole Possé and Legion of Remedies of all Forms and Compositions, from the animal, vegetable and mineral Provinces; but all in vain, as every honest candid Physician will allow, for such Remedies, with what Titles and Encomiums soever dignified, or by whomsoever recommended, can procure no other than a palliative, apparent transient Cure or Reprieve, so long as the original productive Cause of the Disease, the Air, continues to operate with the same relatively disproportionate Properties and Qualities.

58. From what hath been said, it is manifest, that as yet we have no true, certain, perfect Method for the Cure of this Disease, &c. Now all good Physicians will readily allow, that if the Air of any Place could have its Properties and Qualities all chang'd, regulated and adjusted in all Quantities, Proportions and Combinations, until they are brought to operate with such a Momentum and Force, as suits best with the present constitutional State and Structure of this Person's respiring Organs; and to have the said Properties and Qualities of the Air intended or remitted in all Degrees and Combinations, from time to time, and at all times, according as the present urgent Symptoms shall indicate and direct, could this be both duly and judiciously executed, the Person here supposed will receive a thorough, lasting, safe and perfect Cure, which could not possibly be effected by any other Means or Medicines in Nature.

59. From the foregoing Considerations, I shall here propose the following Problem, the Solution, Use and Application whereof, with its several Cases, serves as the Basis and Subject of the following Treatise.

P R O B L E M.

60. To find a Method whereby the Properties and Qualities of Air, Water, and Motion, namely, their Gravity, Elasticity, Pressure, Stimulation, Motion, Heat, Cold, Humidity, Dryness, Effluvia, &c. may be changed, regulated and adjusted in all Quantities, Proportions and Combinations, and of applying and causing the same to operate either upon the whole external human Body, or its Parts, and also upon the respiring Organs, with such a Momentum and Force, as suits and agrees best with the constitutional State and organical Structure of every individual Person; and that at all Times, and for as long a Time, as answers best with the several Indications that offer, either for the Establishment of Health, or the Cure of Diseases.

61. The right Solution of this Problem, with its several Cases, as it comprehends the whole Practice of Physick in its utmost Extent and Perfection, with the whole *Materia Medica*, being of infinitely greater Use to Mankind (to whom Health is the greatest temporal Happiness) than the Discovery either of the Longitude, perpetual Motion, or Philosopher's Stone, &c. therefore naturally claims the most serious Attention and Encouragement of the Publick. And whether I have succeeded in the Solution of this general Problem, with its several Cases, as may be found described in the following Treatise; I humbly submit and refer the same to the impartial Consideration and Determination of the Illustrious and most Learned the College of Physicians in London, &c.

62. From the Observations already made, with what may be found in the following Treatise, the under-mention'd general Rules and practical Aphorisms may be deduced.

63. First general Rule is, Never to account for the original Production of Diseases, from a Chain and Multiplicity of remote hypothetical complex Causes, when the same can be done by others more simple and self-evident; and which we are fully convinc'd from Reason, Experience and Facts, are sufficient and adequate for producing the same. Now those general productive Causes of Diseases I have shewn to be Aliment, Air, elementary Fire or Heat, Exercise or Motion, with the Passions; which general Principles will furnish us both with the true and proper Causes of all Diseases, and likewise with the most perfect, safe, successful, universal Means and Remedies for curing the same, as will be more fully shewn hereafter.

64. Second general Rule is, never to propose or undertake the Cure of any Disease, by a Multiplicity of Means and Medicines, the Properties and Qualities whereof, with their ultimate Effects upon the Body, we never certainly know; such as are most of the artificial Remedies now in Use, when all the same Intentions of Cure can be more safely and perfectly effected by a few simple universal Means and Remedies, which are for that End appointed by Providence, and dispens'd to all Mankind pretty equally and alike, and are endowed with all the Properties and Qualities necessary to constitute them the most sovereign Catholick Means and Remedies; and those we shall find

find to be Aliment, Air, Water, elementary Fire or Heat, Motion or Exercise, with the Passions, which when properly used and apply'd according to the new Methods describ'd in this Treatise, will afford all the necessary Means for attaining Health, long Life, and the Cure of all Diseases.

65. Third general Rule and Maxim is, never to undertake the Cure of any Disease by means of Medicines given internally, when the same can be effected by proper mechanical Methods and Means apply'd to the Body externally; now in this Essay I have shewn, that whatever Intentions are necessary to be produc'd in the animal Solids and Fluids, the same may be effected more safely, expeditiously and perfectly, by proper Methods of applying the mechanical Properties and Qualities of Air, Water, and Motion, to the humane Body externally, as also to the respiring Organs, with the joint Assistance of Aliment, than by any internal Medicines however dignified with pompous Epithets, but for the most prove only false and deceitful Titles.

66. By the new mechanical Methods, describ'd in this Essay, for curing Diseases by applying the Air, &c. outwardly to the Body, and Lungs; this happy Consequence and important Advantage will be obtain'd, namely, that by this Means the Stomach with its Appendage the intestinal Tube, and chylopoietick Organs, will become wholly freed from all the supernumerary Trouble of serving as a common Canal or Sewer, for preparing and conveying Loads of nauseous Medicines to all Parts of the Body, and be kept and left at full Liberty to do what is their natural and proper Office of preparing the Aliment for the Use and Nutrition of the Body; whereas according to the present fashionable Method of curing Diseases by internal Remedies, the Stomach and Intestines, whether they really want such Helps or not themselves, must notwithstanding, sustain and receive the Shock, Battery and Assault of the whole Possé and Medley of Medicines, and that too when the same are intended only for Relief of some of the Outworks and external remote Parts, such as a Tumor, Ulcer, or Inflammation upon the Finger, Toe, or Penis, &c. by which unnatural Method the Stomach and chylopoietick Organs, which are the first principal Organ and Laboratory of the Body, become necessarily demolished by the many violent Shocks, Convulsions, and ungrateful Stimulations which they are thus made to undergo, not only for Relief of their own proper Disorders, but likewise for those of all the other Parts; by which Means they must by Degrees become disabled and incapacitated for doing their own proper Duty, and thereby lay a certain sure Foundation for Diseases of all Sorts; it being an old and true physical Aphorism, that the Errors of the first primary concoctive Gland the Stomach, are not to be made good or repair'd afterwards; so that according to this Method of curing Diseases, Disorders, and Ailments, by internal Remedies, it most commonly happens, that this most essential compound Organ the alimentary Tube and chylopoietick Organs, become destroy'd unseasonably and long before their proper natural Time, and that perhaps to save or give Relief to a Part of infinitely less Consequence, which is curing one Disease, and at the same Time making sure Way for others much worse.

67. Another great and peculiar Benefit accruing from the new Methods describ'd in this Essay, for the Cure of Diseases by applying the Air, &c. outwardly to the Body, is, that this Method will prove not only more perfect and universal, but likewise much safer than by using internal Medicines, the Truth whereof is manifest from this Consideration, that in the Cure of Diseases by the new mechanical Methods of applying the Properties and Qualities of Air, &c. to the Body, as also to the respiring Organs, if any ill Consequence or Effect should be observ'd to ensue therefrom, the Body or Lungs can have the Cause of that Disorder immediately and wholly taken away, whereupon the Effect or Disorder must disappear and vanish of course. But in curing by internal Remedies, the Case is quite different; for let the Medicine be what it will, there is no recalling of it, so that it must have its full Effect, good or bad, upon the Body, neither is any Physician able either *à Priori*, or *à Posteriori*, to ascertain what are its first or ultimate Effects within the Body, nor to determine the Boundaries and Sphere of its Action, nor what Rout or Paths it takes in the Circulation, nor within what Part, or Parts, whether in the Solids or Fluids, its Effects are chiefly manifested, &c. All which Operations and Effects being wholly transacted by imperceptible Agents working in impenetrable Darkness, the Modus of their Operation will be for ever hidden from us. And as to the Issue of the Disease, as well as the Operation and Effects of the Remedy, we can pronounce nothing certain, but must entirely trust to Experience and Observation; our best Reasoning upon such Subjects, how mechanical soever, being only *à Posteriore*. And however, by the Use of internal Medicines, the present Disorder and urgent Symptoms may appear to be subdued and disappear for a Time, as in the Case of curing Agues by the Cortex, and the venereal Distemper, and cutaneous Diseases, &c. by Mercury, &c. yet no Physician the most knowing and experienc'd can give Security, or be answerable, that those very Medicines have not at the same Time done some real irreparable Damage, either to the Solids and Fluids of the whole Body, or of some one or more of its principal Organs or Glands, &c. which is greatly to be fear'd is most commonly the Case. For which Reasons, when the Intentions of Cure can be effected as well or better by external Means, properly apply'd to the Body, and respiring Organs, or to the several distinct Regions and Parts of the Body, that the same will always be found the safest, and consequently the most eligible Method, and ever preferable to the internal invisible Methods of Cure, which are always uncertain, and often dangerous and fatal.

68. That proper Aliment, and Air, with Exercise or Motion, are the true general cardinal Means for preserving Health, and the Cure of Diseases, hath been a receiv'd unalterable Maxim and

and Aphorism with the best Physicians in all Ages ; consequently the true Practice of Physick may be reduc'd chiefly to three general Branches, namely, the prescribing of a proper Regimen with respect to Aliment, Air, and Motion or Exercise. Now the first great Branch of Physick relating to Aliment hath hitherto been greatly neglected and disregarded, and that chiefly from a very weak trifling Consideration, of its being the common, tho' very unequal Subject of every Person's Observation, from whence we find but few Attempts made to improve this most material and essential Part of Physick, except what hath been done by Doctors, *Cheyne* and *Arbutnot*, but in much too general a Manner, to be usefully apply'd in particular Cases. Therefore recommending this as a most copious Subject, and highly deserving to be yet farther improv'd ; I shall proceed to the Subject of this Treatise, which is to shew how the other two general Branches of Medicine, namely, Air, Water, with Motion or Exercise, &c. may be apply'd to the humane Body, and all its several Parts, in the most perfect Manner both for the Preservation of Health, and the Cure of Diseases.

69. But here I think it necessary in the first Place for to enter the following general Remark by way of Advice and Caution ; that as the mechanical Methods to be found describ'd in this Treatise, together with proper Aliment, will be sufficient to answer all the Intentions and Indications that can possibly offer either for the Preservation of Health, or the Cure of Diseases ; it is notwithstanding carefully to be remember'd, that the Use and Application of any of the said mechanical Methods describ'd in this Treatise, however obvious and plain, are not to be rashly and unadvisedly enter'd upon without the special Advice of a Physician, it being a receiv'd Maxim, that whatever is capable of doing great Good, when properly apply'd ; the same when irregularly used will be productive of equal Mischief ; wherefore none but those that have by long Experience, Observation and Study, acquir'd a thorough perfect Knowledge of the Laws by which the animal Machine or Microcosm is govern'd, and who know what Changes and Alterations are wanting in the animal Solids and Fluids, and how the same may be effected by the Mechanical Properties and Qualities of Aliment, Air, Water and Motion, can pretend with Success to direct the proper Times and Seasons, when any of those new mechanical Exercises here describ'd are to be enter'd upon, and for what Space of Time the same are to be continued, with the proper Quantities, Qualities Cases, and other Circumstances relating thereto, &c. And this Observation we find oftentimes verified, and particularly with Respect to the Practice of Bathing, which under a skilful prudent Management will be found of sovereign Efficacy in the Cure of many Distempers, but when injudiciously used, will prove as certainly the Parent and productive Cause of the very same, and most other Diseases ; as will more fully appear from the two new Methods of Bathing, either with Water alone, or with Air alone, or with both the said Elements, and all their several Properties and Qualities, mutually combin'd together, in all Quantities, and Proportions, as describ'd in the two first Chapters of this Treatise, &c.



A

NEW MECHANICAL PRACTICE

O F

P H Y S I C K .

C H A P. I.

General Observations on the mechanical Properties and Effects of Bathing, wherein is proposed the Construction and Description of a new Machine, whereby Bathing of all kinds will be rendered infinitely more efficacious and useful, not only in all the Cases and Diseases wherein it is now used and found beneficial, but in many other particular Cases and Distempers, to which the present Method of Bathing will no wise extend; by which Means the Practice of Bathing will receive the greatest Improvement, and become rendered the most perfect Exercise for preserving Health, and likewise the most sovereign universal Remedy for the Cure of Diseases, &c.

1. **A**MONG the Non-Naturals there is none contribute more to Longevity, Health, and the Cure of Diseases, than a well chosen Diet, with Temperance, a good Air, and a well regulated Exercise; and among all the different kinds of Exercise, there is none that can compare for Efficacy with the Cold and Hot Baths; which, by the concurring Testimony and Suffrage of the greatest Physicians in all Ages, are allowed to be the most universal efficacious Remedies in the whole Compass of Nature; and the many extraordinary Cures that are observed to be daily and evidently effected thereby, which had been attempted before, but in vain, by the use of any other Medicines, serve as an abundant Proof of the Truth thereof.

2. First then with respect to the Cold Bath, the whole mechanical Operation and Effect whereof upon animal Bodies, may be referred to two general Principles, namely, its Coldness, by which it operates as a Stimulus upon the sensitive Organs, and brings the whole System of the Solids into a State of Contraction, which is always the Effect of all Dolorifick Sensation and Stimulation; as Relaxation is the necessary Consequence of all Sensations accompanied with Pleasure and Indolence. But the principal Property wherein its Efficacy chiefly consists, is its Weight and Pressure, for this appears to be the principal Intention and End proposed by Bathing, namely, that in placing the Body under Water, by the additional Weight and Pressure whereof, like to an universal Bandage applied to the Body, the whole elastick vascular System may be strongly stimulated, compressed, and put into frequent contractile and distractile Oscillations, Tremors, and undulatory Motions, whereby the Fluids, if viscid, will be attenuated and rendered more fluxil, and made to move with an increas'd Velocity and greater Freedom throughout the several Series of Vessels, and become better fitted for the Offices of the animal Œconomy, as the Circulation, Secretion, Nutrition, &c. and by the frequent strong Vibrations of the Solids, with the increas'd Momentum of the Fluids, the Glands and Viscera will become scoured, all Obstructions removed, and the Secretions augmented, especially by the renal and cutaneous Glands, &c.

3. Besides the aforesaid mechanical Effects of the Cold Bath, depending upon its Weight, Pressure, and Stimulation, some Authors maintain moreover, that the Water insinuates itself into the Vessels in the time of Bathing: This Opinion, however attempted to be established upon the Evidence of Mathematical Demonstration, I cannot as yet readily subscribe to, not seeing any sufficient Reason to support the same; for if such a general Communication was supposed for the aqueous Particles to pass thus into, and out of the Body, by means of proper inhaling and exhaling Vessels, diffused all over the Cutis, the Sense of Feeling must be inevitably destroyed thereby, inasmuch as the Nerves ministring to Sensation or Feeling, which are plentifully diffused all over the Surface of the Body, would become so soaked and relaxed by the Humidity and Moisture not only of the Bath in time of Bathing, but likewise from the Moisture of the Atmosphere, which must be continually passing into the Body, according to this Opinion, by the *Vasa Inbalentia*, and by what passes out by the *Vasa Exbalentia*, so as to be rendered incapable of performing those quick tonick Vibrations, in which alone the Perfection and Operation of all Sensation consists; for which Reasons I am strongly inclined to the contrary Opinion, that there is no such general Communication for any aqueous Particles to pass either into, or out of the Body, by any Vessels

dispersed throughout the Cutis ; and as for the Discharge of the aqueous and aerial Particles out of the Blood, the animal Machine (as I shall shew hereafter in the third Chapter) is furnished with peculiar Glands and Organs, much better fitted for performing that Office. And I am farther humbly of Opinion, that one principal End and Use of the *Membrana Adiposa*, which is expanded as a universal Covering over the whole Body underneath the Cutis, is designed to serve as a Defence and Barrier to prevent any aqueous Particles either from the Bath or Atmosphere from passing into or out of the Body, the Oil and Fat wherewith the Cells of this Membrane are ever plentifully stock'd, having a repelling Force in respect to Water, the Truth of which Position we find confirm'd from what may be observ'd daily in the Experiment with a Piece of Sponge, Paper, and any animal Membrane or Filter ; which being first well saturated with Oil, the same will never admit Water to pass through it afterwards ; and by Equality of Reason, I think it may be fairly concluded, that in a natural healthful State, no watery Particles, purely such and *per se*, can pass either into or out of the Body, by the Cutis, neither from the Bath nor Atmosphere ; the Adipose Membrane appearing to be designedly and of purpose expanded over the whole Body, to serve as a warm Covering to envelope the Nerves ministering to Feeling, and to defend them from the destructive Effects which they must have otherwise receiv'd, was there any such general Communication by way of the Cutis, for the Circulation and Passage of any aqueous Particles into and out of the Body, which must have entirely destroy'd the Use and Operation of the Nerves ministering to Sensation, by resolving and destroying their Elasticity and Texture, there being a certain Degree of Tension and Elasticity requisite in the Nerves for to perform their respective Functions duly. And this Opinion is still strongly confirmed and corroborated, by observing, that in the more Northerly Climates, as the Air is ever proportionably more cold and moist, all Animals, both terrestrial and aquatick, have this adipose cellular Membrane more plentifully replete with Oil or Fat proportionably, in order to form a sufficient Defence against the Inclemency of the Weather, and to secure the Nerves from being damaged, either by the Intrusion and Absorption of any watery Particles from the Atmosphere inwardly, or by the Emission and Ejection of any such Particles from the Blood outwardly ; for the same Causes which prevent any aqueous Particles from entering into the Body, will likewise hinder any such from passing out by way of the external Cutis.

4. But what I have farther chiefly to observe in relation to the Subject now under Consideration is, that according to the present Practice of Bathing, the principal Property wherein its salutary Effects chiefly consists, that is its Gravity and Pressure, cannot be varied and applied universally *secundum Majus* and *Minus*, and according to all the different Degrees and Quantities of Weight and Pressure ; which necessary Property and Condition it ought to have in order to render it a universal Remedy ; and that for the very same Reason that other Medicines and Remedies require to have their Quantities or Doses diversified and varied, according to the several curative Indications and Cases. Thus for Example, the present Practice of Bathing may be reduced to two Cases, namely, that of a Person Swimming or Diving ; now in the Case of 'Swimming, suppose the Area of the Person's Body equal to fifteen superficial Feet, and taking one Part with another to be immersed two Feet under Water (which is more than what in this Case it really is) in which Case he will sustain an additional new Weight and Pressure from the Water of about 2280 Pounds ; now this is both the very greatest Quantity of Weight and Pressure, and also the very least that a Person can receive from the Water in the Case of Swimming therein, or by placing his Body in any other Posture, and at a like Depth therein ; so that from this Instance it plainly appears, that the Operation and Effects of the Bath depending upon its Weight and Pressure, which is its chief and principal Property wherein its Virtue and healing Efficacy consists, becomes in this Case and Way of applying and using it, of a limited determined Force and Quantity ; so that a Person, let his Case and Condition be what it will, in going into a Bath after this manner, must always receive the very same additional Quantity of Weight and Pressure without Variation. And again, as to the other Case and Method of Bathing, by Diving or Plunging to any considerable Depth under Water, with regard to which it is to be observ'd, that there are but very few Persons that are Masters of this Practice ever to render it of general Use. And moreover, in this Way of Bathing, the Pressure, with the Stimulus, as well that produced by the Coldness of the Water, as that occasioned by the Surprise from the sudden Immersion, become laid upon the Body so quickly and all at once, that unless all the Organs and Viscera are sound, great Damage, and oftentimes fatal Consequences may ensue therefrom, for which Reason this Method of Bathing is rarely practised, except in extreme desperate Cases, as in the *Hydrophobia*, &c. Again, this Practice of Diving or Living under Water (tho' the most successful and efficacious in obstinate Cases) cannot be continued but only for the Space of a few Seconds, which short Time is not sufficient to effect any important notable Change in the animal Machine, by submitting it to a proper Quantity of Weight and Pressure, and for a Time sufficient to produce the curative Intentions proposed thereby. And this is the chief Reason why this Method of Bathing by Immersion or Plunging under Water, so often fails and misses in the Cure of the *Hydrophobia*, as will appear from some farther Observations to be met with in this and the Fourth Chapter, &c.

5. Now, in order to remedy this great Imperfection in the Practice of Bathing, either in cold or hot Water, whereby this, otherwise the most sovereign universal Remedy in Nature (which according

according to the present Practice is render'd only a Remedy of a particular limited determin'd Force and Operation) may be restored, and made to answer all the salutary Purposes and curative Intentions for which it was design'd by Providence. For this End I shall here propose a new Method whereby a Person may have the Weight and Pressure of the Water upon his Body, either increas'd or diminish'd according to any Quantity, and in any Ratio and Proportion requir'd, and as is judg'd will suit and answer best with his particular Case and the Indications of Cure; and the Person be put in a Condition withal for to continue and remain under the Operation and Effects of such additional Weight and Pressure for any Time sufficient to answer and produce all the Ends, Purposes and Intentions that can be propos'd or expected therefrom.

6. For the Method of solving this capital most useful Problem, *vide* Draught and vertical Section, Fig. 1. Plate 1. compar'd with the horizontal Section and Plan agreeing therewith, Fig. 2. wherein let В В В В, represent either a cylindrical or square Vessel or Barrel of cast Iron, of two, three, or four Feet in the Clear or Bore, and of six, eight, or ten Feet in Height or Length; so that a Person may have Room either to stand upright, or sit down within the Barrel or Vessel upon Occasion. This Barrel (which for better Distinction I shall hereafter call the Bathing Vessel) may be cast with a solid close Bottom at one End, and upon the lower open End, which must have a broad Ring or Flanch, there must be fix'd with Screws or Rivets a strong even metallick Plate n n, with oil'd Leathers between to secure the Junctures, so as to render it very tight; in the Middle of this bottom Plate n n, is a round Hole o o, wide enough to admit a Person to go in and out thereat; withinside the Bathing Vessel and over this Hole there is fitted a circular metallick Plate or Cover u u, upon the under Side whereof is a Ring projecting a small Way above the Plain of the Plate, the under Edge of which Ring being turn'd very true and even, bears upon the Inside of the bottom Plate n n, with oil'd Leathers between, to secure any Water or Air from escaping out of the Bathing Vessel, which must be Wind and Water tight; this Cover or Valve Plate u u, may be fitted to open and shut by turning upon an Axis or Hinge, for to let a Person pass in and out of the Bathing Vessel, (a separate View and Section whereof with the circular Motion describ'd by the Valve or Trap-door u u, in opening and shutting may be seen by the two Sections, Fig. 11. and Fig. 12.) Upon one Side, and down towards the Bottom of the Bathing Vessel, is ingrafted a Pipe d z, which communicates with several other Pipes proceeding from different Origines; thus it communicates by means of the perpendicular Pipe n p, with a large Copper or Boyler n, kept fill'd with hot Water; as also with the Cistern c, fill'd with cold Water, by means of the Pipe c p; the said Pipe d z, communicates also with the hydraulick Engine a a a a, by means of two short detach'd Branches, namely, s s, which denotes the sucking Pipe, and f f, the forcing Pipe, (*vide* Plan Fig. 2.) which Engine having a Communication by means of the Pipe w w, with some Reservoir or Well of Water, (which is not express'd in this Draught) serves for to throw the Water either directly into the Bathing Vessel through the Pipe d z, or up into the Copper n, to be heated for bathing, or into the Cistern c, which supplies the Bathing Vessel with cold Water; all which several Intentions become answer'd by opening and shutting the proper Cocks of the respective Pipes of Communication. Now the Copper n which furnishes the Water for the Hot Bath, and likewise the Cistern c, which supplies the Water for the Cold Bath, ought both to be elevated and rais'd to such a Height in respect of the Bathing Vessel, that the Water may have a sufficient Elevation and Command over the Bathing Vessel, so as to be capable to fill the same immediately when wanted, the Water running directly out of the Copper or Boyler n, as also out of the Cistern c, into the Bathing Vessel through the Pipe d z, without passing through the hydraulick Engine a a a a, which Engine raises and forces the Water by a continued circular Motion of the Axis A A, to which there are fitted two Forcers working in one and the same Barrel a a a a, whereby the Water is kept flowing in a constant Stream through the Force Pipe, and that without the Use of any Valves, which are the chief and great Imperfection and Obstruction in all the modern Water-Works; now as to the Structure, Composition and Mechanism of this hydraulick Engine, with the Manner of applying the several auxiliary Powers thereto, the same could not possibly be represented here any otherwise than in general by this Figure, and as I have already given a full and particular Description, with Draughts and Models of all its several Members, together with several other new Machines, in a Treatise relating to Hydraulicks, to which I must refer for Brevity. Moreover this same Engine is fitted by virtue of its Structure, for forcing and condensing Air, as well as for forcing and raising Water, and the same is here understood to serve indifferently either for forcing Water into the Bathing Vessel, or for forcing and condensing, or for rarefying and exhausting the Air in the said Bathing Vessel as there is Occasion; for which Reason I shall call it indifferently by the Name of the Hydraulick, or Pneumatick Engine, according as it is apply'd for forcing either Water or Air into, or out of the Bathing Vessel; and when the Engine a a a a is used either for condensing or rarefying the Air in the Bathing Vessel, in that Case all the Cocks upon the several Water-pipes must be close shut, and nothing but Air permitted to come into the Engine Barrel, which may be done by having a short Pipe solder'd on either to the Bottom or Side of the Barrel, (which Air-pipe is not express'd in this Draught, to avoid embarrassing the Figure with a Multiplicity of Lines and Parts, that may be readily conceiv'd without any linear Representations) the Air having free Access and Communication with the Engine Barrel by the said Air-pipe, is afterwards thrown forcibly out first thro'

the

the Force or ejecting Pipe h d, into the Vessel x x x x, which may be of Iron, Copper or Glass, out of which Vessel it is further propel'd and forc'd into the Bathing Vessel, through the injecting Pipe i p, which is provided with two Cocks, one withinside, and the other withoutside the Bathing Vessel. Now in order to know at any Time what Quantity of Air is in the Bathing Vessel, with the Degrees of its Density, Elasticity and Pressure, for that Purpose upon one Side of the Bathing Vessel is fix'd a small Vessel e e e e, which may be of Glass or Iron, and fill'd with Mercury as high as the prick'd Line m m; upon the Surface of the Mercury let some other Fluid, as Water, be pour'd to the Height mark'd, by the other prick'd Line w w, this Glass Vessel communicates with the Bathing Vessel by the Pipe e s, into which Glass Vessel is fitted a Glass Tube or Pipe b b, close at Top, but open at the lower End, which is immerg'd into the Mercury, and to that Part of the Tube withoutside of the Vessel there is affix'd a Scale divided into a proper Number of equal Parts, more or less as there is Occasion; which being done in Proportion as the Air in the Bathing Vessel is more or less condens'd by the Pneumatick Engine a a a a, the Air in the Glass Vessel e e e e, above the Surface of the Mercury, being at the same Time equally condens'd, will cause the Mercury to rise to different Heights in the Tube b b, (which for better Distinction I shall call the Mercurial Gage Tube) which with the Scale annex'd thereto, will show at all Times the true State of the Air in the Bathing Vessel, with respect to its Density, Elasticity and Pressure, and how much the same is either condensed or rarefied over or under the mean State of the Atmosphere, which at a Medium is equal to counterpoize a Collum of Mercury of about twenty-nine Inches high. And in order to discover at all Times the Temper and State of the Water and Air in the Bathing Vessel, as to the Degrees of Heat arising therein, for that End there is another small Glass Vessel r r r r, fix'd on to the Side of the Bathing Vessel, with which it communicates by the Pipe r q; in this Glass Vessel is plac'd a Thermometer r r, with a Scale affix'd thereto, serving to mark all the Gradations of Heat from that of the greatest natural or artificial Cold, to that of boiling Water and upwards; which extream Degrees of Heat are not intended for the Practice of Bathing, but may be of good Use for trying some Experiments upon brute Animals, with a View to clear up fundry Points relating to the Animal Œconomy; which Experiments may be commodiously made in such a Vessel with a proper Apparatus, &c.

7. All Things being thus disposed in the Manner as hath been describ'd in the last preceding Number, I come in the next Place to exemplify and explain the Practice and Use of this new bathing Machine. For this Purpose the Door or Valve u u, at Bottom of the bathing Vessel being set open, (as is shewn by Fig. 11.) The Person taking hold of the End o of the Rope, the other End whereof is made fast to a Ring or Eye-bolt r, fix'd withinside at the upper End of the Vessel, and thereby draws himself up into the upper Part of the Bathing Vessel (which upper Part for Distinction I shall call the Air-Chamber) upon the Inside whereof is fitted a Board s s (vide Fig. 1.) made for to turn by means of a Hinge with its Plane either perpendicular to the Side of the Vessel, in which Position it serves as a Seat for the Person to sit upon; or the said Board may be plac'd with its Plain flat against the Inside of the Vessel, when there is Occasion for more Room within the Vessel. The Person being thus seated in the Air-Chamber, at the upper End of the Bathing Vessel, waits for the coming in of the Water, during which Time he may amuse and exercise himself with a Flesh Brush, or the Board s s, whereon he sits, may be made pendulous, instead of being fixed with a Hinge, and so contriv'd and pois'd by means of Springs, as to afford him an Opportunity of exercising himself upon this springing pendulous vibrating Chair, as if he was riding in a Coach. Moreover, either at top, or upon the Side of the Bathing Vessel, there may be fix'd a small Piece of strong Glass, by which the Inside of the Vessel may be illuminated, either by the Light of the Sun, or of a Candle, to shew the Person in the Bathing Vessel what is necessary to be done, and to enable him to converse with the Persons attending withoutside the Bathing Vessel, &c. Now I will suppose the Person to bathe with cold Water, for that Purpose the Trap-door or Valve u u, being close shut, let the Cock of the cold Water-Pipe c p, be set open, whereupon the Water will rush out of the Cistern c, through the Pipe c p d, directly into the Bathing Vessel, which may be fill'd therewith to any Height requir'd, as suppose to the prick'd Line w i, so that when the Person comes to descend out of the Air-Chamber into the Water, and standing upright therein, he may be wholly cover'd therewith, the upper Surface of the Water reaching just above the Top of his Head, as is shewn by the little Image or Picture within the Bathing Vessel. But before the Person descends out of the Air-Chamber into the Water, the Cock upon the cold Water-Pipe being close shut for to keep the Water at its intended Height in the Bathing Vessel, let the Pneumatick Engine a a a a be now set to work, to condense the Air in the Air-Chamber, which may be done in any Proportion requir'd; the Air in the Air-Chamber being brought to have the just Degree of Density and Pressure intended, and such as is judged will answer best with the Intentions and Indications of Cure which the particular Case of such Persons may require; which Degree of Density, Elasticity and Pressure of the Air in the Air-Chamber, may be most exactly known by observing the mercurial Gage Tube b b, noting the Height of the Mercury by the corresponding Divisions and Numbers of the annex'd Scale. Now as the Air becomes more or less accumulated and condens'd within the Air-Chamber, the same will communicate a proportional Pressure to the Water in the Bathing Vessel: Let us suppose then the Air in the Air-Chamber to be condens'd into half the Volume and Space which it would occupy and possess

if only compress'd by the external Atmosphere; which being done, let the Cock of the injecting Pipe *IP* be close shut, to prevent any Air from escaping out of the Air-Chamber, whereupon the Person taking hold of the Rope *RO*, quits his Seat, and thereby lets himself down into the Water, so that when standing upright therein, the upper Level or Surface of the Water mark'd by the prick'd Line *WI*, may just reach above the Crown of his Head. In which Case this Person will be very differently affected to what he would be if placed in the same Depth of Water, and exposed only to the open unconfined Atmosphere; so that supposing the Area of this Person's Body to be equal to fifteen superficial Feet, and being placed with his Body erect in the Water, and taking one Part with another, suppose his Body to be immersed two Feet under Water, (equal to what it is in Bathing according as is now practised) the additional Pressure which he will sustain in this Case by Bathing in such a Depth of Water, and exposed only to the Pressure of the Atmosphere, will be equal to about 2280 Pounds Weight; whereas the additional Weight and Pressure which he will sustain by Bathing in the very same Depth of Water, but exposed to the Pressure of a double Atmosphere, or of Air twice as dense as common Air, as the Air in the Air-Chamber is supposed to be, will be equivalent to about 39900 Pounds Weight; which is almost twenty times the Quantity of Pressure which he sustain'd in the other Case; and consequently as the Effects produc'd from such additional Quantities of Weight and Pressure thus laid on, and applied to the animal Machine, must ever be proportional to their Causes, in such wise that the Effects and Alterations produc'd in the Person's Body by the Method of Bathing as in the first Case, (which is the same with that in Practice) will be only but about one twentieth Part so great as in the second Case, according to this new mechanical Method of Bathing; so that in this Case only there is twenty Chances to one of Curing any Disease, that is curable by Means of applying universal Stimulation and Pressure to the Body by this new Method, above what can be obtain'd from the present Practice of Bathing. So that when the Air in the Air-Chamber is of twice the Density of common Air, the Person when standing, with the upper Surface of the Water at *wi*, just covering the Top of his Head, sustains the same Pressure as if he was immerg'd to the Depth of thirty-six Feet under Water in the open external Air; and if the Air in the Air-Chamber be render'd five Times denser than common Air, the Person in the Bathing Vessel will sustain a Pressure equal to what he would do, by being immerg'd to the Depth of one hundred and eighty Feet under Water, and exposed only to the Pressure of the external Air or Atmosphere; so that the Quantity of Pressure that the Person will be subject to in this Case, when the Air in the Air-Chamber is five Times as dense as common Air, will be upwards of one hundred Times greater than what it ever is or can be according to the present Practice of Bathing; and as the Air in the Air Chamber admits of being condens'd in all possible Proportions and Degrees, so its Pressure upon the Body may be render'd of all Quantities requir'd. And as the healing Virtue and Efficacy of the Bath consists chiefly in its Weight and Pressure, which in the present Practice is only of one limited definite Quantity, whereas according to this new Method the Degrees and Quantity of Pressure may be varied in all Proportions, so as to be render'd a hundred or a thousand Times greater than what it is or can be in the Method of Bathing now in Use; so that this new Method will extend and become applicable to one hundred or a thousand different Cases, whereas the Method now in Practice extends only to one single particular Case or Degree of any Disease. Now on the other Hand, if instead of condensing the Air in the Air Chamber, the same be exhausted in part or in whole, according to any Proportion, by the same pneumattick Engine, which serves equally either for condensing or rarefying the Air, in which Case if the Air be understood to be exhausted one fourth Part, the Person when standing upright as before in the Water, will sustain five Times less Pressure than what he would do in a common Bath: Again, if the Air in the Air-Chamber be render'd only one half as dense as common Air, in that Case the Person in the Bathing Vessel will sustain about ten Times less Pressure than what he would have done by Bathing in the like Depth of Water in the open Air. And if the Air be suppos'd wholly exhausted (which extreme Case it may probably never be proper or necessary to try upon Mankind, whatever it may upon Brutes) in such Case the Person would sustain only one twentieth Part of the Pressure that he would do in Bathing the ordinary Way. And after this Manner the additional Weight and Pressure upon the Person's Body, may be not only augmented to all Degrees required above what it is in the ordinary Way, but be likewise diminished below what it is the common Way, &c.

8. Having describ'd the Use of this Machine as it serves for Bathing with cold Water, if now it was requir'd to be used for Bathing with hot Water; in that Case the Bathing Vessel being emptied of all the cold Water, by letting it run out through the waste Pipe *LP*, at Bottom of the Vessel, and then upon turning open the Cock of the hot Water Pipe *HP*, the Bathing Vessel will be immediately filled to the same Height as before with hot Water out of the Copper or Boyler *H*, and during the Time the Bathing Vessel is thus emptying of the cold Water, and filling anew with hot Water, the Person may retire to his warm Air-Chamber, where, placing himself upon his pendulous vibrating springing Seat *SS*, he may amuse and exercise himself, as before described. And when the Bathing Vessel is filled with Water to the Height intended, he may descend from his Seat into the same, by taking hold of the Rope *RO*, and letting himself down therein, where he may continue for any Time proper to answer any Intentions of Cure, or

as long as he pleases, and under any Quantity of Pressure, and likewise under any Degree of Heat, as is judged most proper to answer the particular Indications of his Case. The proper and intended Degree of Heat, being to be regulated and known by observing the Thermometer *rr* ; and the Degree or Quantity of Pressure intended may be known or adjusted by the Mercurial Gage Tube *bb*, with the respective Scales annexed thereto, as has been shewn in the foregoing Number, where the Person was supposed as making use of the Cold Bath ; there being no other Differences in the two Ways of Bathing, but only in respect of the Qualities of Heat and Cold. And the Person, whether in using the Cold or Hot Bath whensoever he has a mind, may immediately disengage his Body from the Water, by retreating into the warm Air-Chamber, by taking hold of the Rope *ro*, wherewith he raises his Body out of the Water, and, seating himself upon his Springing-Chair, may regale himself with such Exercise as that Machine may be made to afford, namely, that of Agitation and Succussion, like as riding in a Coach, or on Horseback, &c.

9. Having thus found a Machine, whereby the humane Body may be made to receive an additional, universal, equable Compression from without ; and having shewn farther how this additional Pressure may be varied, regulated and applied, in all possible Quantities that can be required to answer all Cases and Intentions of Cure whatsoever. Now, to render this Method perfect, there remains one Case still to be solved and answered, and that is, to contrive a Way whereby the Person, whilst inclosed within the Bathing Vessel, may enjoy a free and perfect Respiration. Now, in order to solve this Case and Problem, various Methods may be suggested, such as the following. First, then, suppose the upper Level of the Water in the Bathing Vessel to rise no higher than to the prick'd Line *w 2*, so that when the Person stands upright his whole Head may appear above or without the Water ; in which Case, upon bending his Knees, and shortning his Body, he may bring his Head all under Water, and so receive the same Benefit therefrom as in the Case before, when the upper Surface of the Water was supposed raised as high as *w 1*, above the Person's Head when standing upright therein ; so that whenever he wants to take fresh Breath or Air, he must bring his Head above Water until he has expir'd the old, and inspir'd a fresh Charge of new Air ; which having done, he may dive, or bring his Head wholly under Water as before, until he wants to respire again, when raising his Head above Water he takes in a fresh Supply of Air out of the Air-Chamber as before, and so alternately and successively for any Time requir'd. But as the Air in the Air-Chamber will become in Time effete and unfit for Respiration, partly on account of having absorb'd so much of the Vapours and Steam arising from the Persons Lungs and Body, that it can receive or exhale no more, and having its Spring and Elasticity greatly alter'd and chang'd thereby, and by the Heat communicated thereto by the Person's Body. Now for to remedy this Inconvenience, for that Purpose upon the upper End of the Bathing Vessel there is folder'd an Air Pipe *yy*, with two Cocks thereto, one withinside, and the other withoutside the Bathing Vessel ; if now the Person finds the Air becoming anywise troublesome and unfit for Respiration, turns open the Cock of this Air-pipe, all the rarefied corrupted Air will rush out of the Air-Chamber and become discharg'd and exhaled into the Atmosphere, and setting the pneumatick Engine *aaaa* to work, the Air-Chamber may be perfectly ventilated and purg'd of all the corrupt Air, and being again replenish'd with fresh Air, upon shutting the Cock of the Air-pipe *yy*, and continuing either to inject more Air, or to exhaust and rarify the Air in the Air-Chamber as there is Occasion, the Air may be brought to have the same Density, and Pressure as before ; which being done, let the Cock of the injecting Pipe *rp* be shut, for to prevent the Air from returning back out of the Air-Chamber, and then the Person in the Bathing Vessel will have the Air-Chamber replenish'd with a fresh Stock of Air, and of the same Density Elasticity and Pressure as at first, and thus alternately and successively for any Time requir'd. Another Method of providing for the Person's Respiration whilst inclosed in the Bathing Vessel, is after this Manner ; let the lower Part of the Vessel *xxxx*, which may be of Glass or Iron, be fill'd with Mercury, the upper Surface whereof is denoted by the prick'd Line *mm*, and upon the Top of the Mercury let some Water or other Fluid be poured to the Height mark'd by the other dotted Line *ww* ; *bb* is a Glass Tube from ten to twenty Feet in length, or more upon Occasion, the lower incurvated End whereof being open is immerg'd into the Mercury. If now the pneumatick Engine *aaaa* be set to work, the Air may be injected in any Quantity into the upper Part of the Vessel *xxxx* through the Pipe *dh*, and the exact Degree of its Condensation within the said Vessel will become known, by observing the Station and Ascent of the Mercury in the Gage Tube *bb*, with its corresponding Scale ; and as the other mercurial Gage Tube *bb*, within the Vessel *eeee*, upon the opposite Side of the Bathing Vessel, shews the Degrees of Condensation and Pressure of the Air in the Air-Chamber ; by Means of which two mercurial Gages, the Air in the Air-Chamber, and that in the Vessel *xxxx*, may be brought to have either the same Degree of Density and Pressure, or that of any other different Degrees, and in all Proportions requir'd. The Vessel *xxxx* (which for better Distinction I shall name the Respiring Vessel) is join'd on to the Side of the Air-Chamber, by a small Pipe *ap*, to the inner End *a* whereof within the Air-Chamber, there is join'd the End of a flexible, membranous, leather Pipe *ra*, (which I shall for Distinction call the Respiring Pipe) the other End whereof *r*, the Person holds in his Mouth, which End of the Pipe may be form'd and constructed, somewhat

what resembling the Reed or Pipe of a Hautboy, with two small Plates that shall shut close together by a Spring or Valve, or there may be a Protuberance or Swelling, o, upon the Pipe; within which is a Valve to be open'd by the Hand, so as to permit no Air to pass in, or out, through the Respiring-pipe; but upon the Person's taking the End, r, of the Pipe into his Mouth; and pinching the same between his Teeth, or with his Hand setting open the Valve within the Protuberance, o, the Spring Valve commanding the Orifice of the Pipe becomes thereupon open, and upon his Inspiring or Sucking, the Air will come in from out of the Respiring Vessel, through the Respiring-pipe r a, and inflate his Lungs; and in performing the Act of Expiration, he may either eject the Air out of his Lungs into the Air-Chamber; or by having such another flexible Pipe, as r a, to fix on to the short Pipe 45, solder'd on to the Side of the Bathing Vessel, by taking the End of which Pipe into his Mouth at every Expiration he may eject the Air out of his Lungs into the open Atmosphere. The Suction or Respiring-pipe being thus constructed; that the End r, which the Person holds in his Mouth, keeps always close shut up of itself by the Spring Valve, there is no Necessity for his keeping the End of the Respiring-pipe always in his Mouth, but only at such Times as he wants to breathe or take fresh Air. It is however to be remark'd, that the Person must not respire or receive any Air by his Nose, which for that End must be kept close shut or stopt by a Spring Wire made to press outwardly upon the Alæ or Wings of his Nose, or other such like Contrivance and Device, of which there may be Variety: So that by this Method a Person may have the Air serving to his Respiration, during the Time he is in the Bathing Vessel, render'd either exactly of the same Gravity, Density and Elasticity with the Air in the Air-Chamber incumbent upon his Body, or of any other Degree of Density and Pressure, as he finds suits best with the constitutional State of his Respiring Organs. Or the Person during the Time of Bathing may be put in a Condition for to respire or breathe with the external Air, to this Purpose there is a Pipe 45, ingrafted on to the Side of the Bathing Vessel, upon that part of the Pipe withoutside the Vessel are solder'd two short Branches 52, 53, upon each whereof is a small Protuberance or Cylindrical Cavity e and r; in the first whereof is a Valve opening outwards, when push'd against by the Air passing out through the respiring Pipe into the Atmosphere, but becomes shut when push'd against with a contrary Direction; in the other Protuberant Part r, is another Valve, which opens inwards to let Air come in through the respiring Pipe, but hinders any from passing outwards through the same; if to the inner End 4 of this respiring Pipe be join'd such a flexible Pipe as r a, the Person will be thereby enabled to respire or breathe with the common external Air, for upon his pinching the End r of the respiring Pipe between his Teeth, and beginning to suck, the external Air will push open the Valve in the Appendage r, and coming in will expand and inflate his Lungs, the other Valve at e being then shut, and in the Act of Expiration the Valve in the Appendage e, will be thrown open, the other Valve at r being then shut, and thus alternately. But if the Person keeps the End of the respiring Pipe constantly in his Mouth, (which he may with as little Trouble as smoaking of a Pipe of Tobacco) there will be no Occasion for either of the two short Pipes or Appendages e and r, with the Valves therein; for in that Case the Air may be received and ejected through the open Pipe 45, without any such Valves, so that by any of the aforesaid Methods, the Person in the Bathing Vessel, being furnished with such a flexible respiring Pipe, may descend safely, and continue immerg'd wholly under Water for the Space of a Day or longer, if required, being thus provided with as free and perfect a Respiration, as if in the open unconfin'd Atmosphere.

10. Among the many great Advantages to be obtain'd from this new Bathing Machine; there is the following of singular Efficacy in particular Cases, which is this: The Bathing Vessel being entirely emptied of Water, by setting open the Cock of the waste Pipe 1. p, if the Person in the Bathing Vessel be furnish'd with a flexible leather Pipe made to screw on to the End d; of the Pipe a d, withinside and down towards the Bottom of the Vessel, upon doing which, if the hydraulick Engine a a a a be set to work, by applying Men to the Levers or Capstane Bars a a; and being supply'd either with warm Water from the Copper or Boiler n, or with cold Water out of the Cistern c, the same may be projected and thrown with great Velocity through the Pipe a d, and the Person in the Bathing Vessel holding the membranous, flexible, leather Pipe in his Hand, may direct the Stream either cold or hot, upon any particular Region or Member of his Body, and if the Orifice of the flexible Pipe be arm'd with a Brass Plate or Socket, perforated with many small Holes, the Stream of Water will thereby become divided into so many lesser Streams or Jetdéaus; which Method of applying the Water to the Body, will in some Cases produce a much better Effect, than by letting the Water fall or impinge against the Body in one single undivided Stream; and as the Water is capable by such an Engine of being projected with all Degrees of Celerity, through such a leather Pipe, the same will prove of very great Efficacy in that respect in the Cure of many Distempers, as Tumors, &c. especially those retaining to the chronical Kind, by reason of the Stimulus, with the frequent strong Vibrations, Tremors, Concussions, and Pulsations, that will become thereby produced, kept up, and propagated through the several small Machinulæ and elastick linear Solids of the muscular Fibres and Nerves; by having the Water projected and thrown against them alternately by Jerks and Strokes, and with all Degrees of Velocity and Impulse. Which End and Intention can no ways be answer'd so well by the common Method of Pumping, by reason the Water not being thrown
against

against the Person's Body with a sufficient Impetus and Force, is not capable of exciting such strong and lasting Undulations and Oscillations in the original elementary Solids, in order to dislodge the cold stagnating Humours, and fit them either for Circulation, Transpiration, or Suppuration, which appear to be the chief Ends and Intentions proposed by this particular Method of Pump-Bathing.

11. Now in order to render this new bathing Machine more compleat and universal with respect to its Use in the healing Way; with that View there is added thereto as a farther necessary Appendage, another Vessel or Boyler *v v v v*, (it is however to be noted, that all the Uses of this Vessel may be answer'd by the other Copper or Boyler *н*, so that this other Copper is added only for the better Distinction and conceiving the several distinct Offices and Uses of the Machine) this Vessel is close shut with a Cover at Top, upon one Side and towards the upper End is ingrafted a Pipe *v p*, with a Stop-cock; the other End *p*, is join'd to the Pipe *д z*, by which it communicates with the Bathing Vessel, the Use of this Vessel being to generate and produce Vapours and Effluvia, either humid or dry, or both together, and that either from pure simple Water alone, or from Water mix'd and allay'd with any other Materials, Solids or Fluids, or both, furnished from the Animal, Vegetable and Mineral Kingdoms, in all Quantities and Proportions; or the Vapours and Effluvia may be produc'd from any single Body, Solid or Fluid, or from any Number of the same united and combin'd together, in such Quantities and Proportions as is judg'd will answer best to promote the Indications of Cure. The Ingredients whether Solid or Fluid, from which the Exhalations and Effluvia are to be produc'd, are understood to be plac'd at Bottom of the Steam Vessel, as within the Space *v v u u*, the Materials whether solid or liquid, or both together, upon applying a proper Degree of Heat thereto, either by means of boiling Water, or a naked Fire, a Sand Heat, Attrition, &c. the same will emit various Quantities of Vapours and Steam of different Kinds and Qualities, according to the Degrees of Heat apply'd thereto; which Vapours will become elevated and rais'd to the upper Part of the Copper, between its Cover and the prick'd Line *u u*, which Steam or Halitus when accumulated and collected in a sufficient Quantity, upon setting open the Cock of the Steam-pipe *v p*, the Vapours will rush through the said Pipe into the Bathing Vessel, which may be impregnated and fill'd therewith in any Quantity desir'd; and in case the Steam hath not Force enough of itself to fill and saturate the Air in the Bathing Vessel so strongly therewith as requir'd, in such Case the Steam or Vapours may be made for to pass first through the Pneumatick Engine *a a a a*, by which it may be forcibly thrown and crowded into the Bathing Vessel in any Quantity desir'd, so as to render the Vapours of all Degrees of Strength, Density, Elasticity, Spissitude and Pressure; as also in respect of the medicinal Qualities and Virtues of the Ingredients from which they were produc'd and generated, so that the Air in the Bathing Vessel shall be sufficiently impregnated and absorb'd with the Particles and Effluvia thereof; by which Means the same may be prepar'd and fitted, so as perfectly to answer all the curative Intentions which are very many and great, that may be derived from submitting the whole Body to such a general Fumigation and Irroration, by the Use of such Vapour-Baths, both humid and dry, &c.

12. By the other vertical Section, Fig. 3. Plate 1. the very same Machine and Apparatus for bathing is shewn, with that of Fig. 1. before describ'd, only with some Difference respecting the Situation, Disposition and Arrangement of the Parts and Members thereof; the chief Differences are, that the Bathing Vessel *в в в в*, which in Fig. 1. is shewn as standing with its Axis perpendicular to the Horizon, is in this other Draught represented with its Axis parallel thereto; with a posterior View or Section of a humane Body, lying extended at full Length upon one Side within the Vessel, and covered either wholly under Water, the upper Surface whereof being in that Case denoted by the prick'd Line *д о*, or the Body may only be cover'd in Part with the Water, the upper Surface whereof being then suppos'd at the prick'd Line *w w*; *r p* is the Suction or respiring Pipe, by which the Person is supply'd with fresh Air of any Density, out of the respiring Vessel *x x x x*, for to enable him to breathe withal, &c. And as all the similar corresponding Parts of this Machine are marked with the like Characters, as in the other Draught of the Machine, Fig. 1. and which has been explain'd in the preceding Numbers, by referring whereto, what farther relates to the Understanding of this Draught will become readily known.

13. Now with respect to this new mechanical Method of Bathing, for farther Illustration of the Uses and Benefit thereof, I shall here subjoin some general Remarks and Observations. Now the principal Property wherein the healing Virtue and Efficacy of the Bath consists, abstracting from its Operation consider'd as a Stimulus, is the additional Weight and Pressure that becomes thereby laid upon the Body, which like to a universal Bandage and equal Stricture serves to compress, contract and stimulate the whole System of the Solids, whereby if any Degree of Viscidity or Lensor prevails in the Fluids, which is commonly the Case in most Diseases, the same will become broke and dissolv'd by the frequent strong Vibrations and Oscillations excited and produc'd throughout the whole elastick vascular System, whereby the Secretions will be increas'd, and Obstructions in the Glands and Viscera removed, the Solids receiving at the same Time a sensible Addition of Strength from their being contracted, and having their small elementary compounding Fibres and Machinulæ brought into closer Contact and Union, by the Pressure and Stimulation of the Water. But as has been already observ'd, the chief Property of the Bath, namely, its Weight and Pressure,

is reduc'd according to the present Practice of applying it, within very narrow Limits; thus for Example, a Person upon going into any common Bath can't place his Body therein, so as to receive any greater additional Pressure therefrom, than what is equal at most to two perpendicular Feet of Water, nor can he well receive any lesser Quantity, if he intends to bathe his whole Body, so that this essential principal Property of the Bath, consisting in its Weight and Pressure, becomes hereupon limited to one certain definite Quantity only; no Wonder then that its great and extensive Virtue and salutary Effects, have been hitherto limited and in a great Measure lost also, as we find to be the Case at present. Now to illustrate and exemplify this Point farther, it will be sufficient for that Purpose duly to consider and weigh the following supposed comparative Case. Suppose then two Persons, one of which is of a strong robust athletick Constitution; and the other of a weak, relax'd infirm State, as to their Solids; now both those Persons upon going into the same Bath, must receive the like Pressure and additional Weight therefrom (supposing their Bodies of equal Dimensions) notwithstanding one of them is, and may be in a Condition to sustain twice the Quantity of Pressure and Stimulation that the other Person can; and his Case will necessarily require it, supposing his Solids to have twice the Strength as to Resistance, Cohesion and Elasticity; let us again suppose that the Quantity of Pressure, which both Persons receive equally and alike upon going into the same common Bath, to be exactly fit and duly proportion'd in respect of the strong Person; and that the stimulating Force of the Bath, in respect to the Degrees of Heat and Cold, is likewise well proportioned and suited to the constitutional State and Temperament of his Body; it must follow by necessary Consequence, that the same Degree and Quantity of Pressure, with the same Degree of Stimulation, can never be proper and duly suited to the other weak valetudinary Person; by reason such over great Quantity of Weight and Pressure join'd to a like disproportionate Stimulation, must greatly weaken and destroy the Spring and Motive Force of the Solids, instead of contributing to restore and increase the same, which is what is chiefly intended by Bathing; so that in this Case the strong Person will receive a real Benefit from the Bath, but the weak Person a real manifest Damage. But now in this Case it must be carefully remark'd, that the true Reason why the Bath proves beneficial to one of the two Persons, and prejudicial to the other, is because its Momentum, Force and Efficacy, that is its Pressure and Stimulus, are both duly proportioned to the constitutional State of the Solids of the strongest Person, but was not so in respect to the other Person, the Case being here exactly alike and parallel, with giving a Child the same Quantity or Dose of some strong Emetick or Cathartick as to a grown Person; the first it must of Consequence greatly injure if not destroy, whilst it may produce a good Effect upon the adult Person; and just after the same Manner may the cold and hot Baths be either over-dosed or under-dosed, and by that Means become either beneficial or prejudicial accordingly. But to return to the above supposed Case of the valetudinary Person; now it is allow'd that Bathing would be of equal Advantage to him, as well as to the other strong Person, could both the Pressure and Stimulus of the Bath be duly and properly adjusted and proportioned to the relative weak relax'd State of his Solids; but as this Intention can't possibly be obtain'd by any of the Ways of Bathing as now practis'd; from whence it follows, that as this principal essential Property of the Bath can't be varied from less to greater, and the contrary, but being always apply'd to all Persons, and in all Cases, according to one immutable certain Quantity, like to a Medicine always exhibited according to one settled Dose, without any Regard to the different Ages, States and Constitutions of Persons, whether old or young, strong or weak, &c. from whence it necessarily comes to pass, that the present Method and Practice of Bathing becomes not only limited as to its Operation and salutary Effects, but proves moreover oftentimes greatly prejudicial by being thus apply'd and administred like to an over or under Dose of a Medicine. Now in what Manner this great Imperfection and Objection with respect to the Practice of Bathing may be remedied, I have endeavoured for to shew by this new Machine; according to which new Method of Bathing, as plainly appears from what has been said in the foregoing Numbers, this principal and chief Property of the Bath as to its Pressure, &c. may be varied from less to greater, and contrarily, according to all Degrees and Quantities that can be necessary to answer any Intention of Cure, whereby the Practice of Bathing will by this new Method become now the most universal Remedy, and deservedly claim the first Rank and Place preferable to all other Medicines in the *Materia Medica*; being now render'd capable of being apply'd and exhibited like as other Medicines are, according to proper Doses, Weight and Measure, so as to fit and suit exactly to the Case, Condition and constitutional State of every individual Person, in such wise as fully to answer all the Indications that can be wanted either for preserving Health or curing Diseases.

14. The Practice of Bathing being thus retriev'd and rescued from its present narrow State and Confinement, and from its being only a particular Remedy, operating with a definite limited Force and Virtue, is now render'd by this new Method an universal Remedy of general unlimited Efficacy in all Cases wherein Bathing of any Sort can be proper and of Use, in such wise, that where Bathing would only suit and fit well to one Case before, it may now be made to answer and be of Use in a hundred or a thousand different Cases; and consequently where it serv'd to cure one Person, or one Case before, it will now serve to cure a Hundred or a Thousand; and as such may be justly reckon'd, as the same is now improv'd, as the most efficacious capital Remedy in Nature; and when properly and judiciously apply'd, will serve to produce

all the primary Intentions wanting in the Solids and Fluids towards the Cure of Diseases; all which Intentions of Cure may be compriz'd in this general one, in Regulating the Momentum and Quantity of Motion in the Solids and Fluids, so as to preserve a due Equilibrium between those two principal antagonist Powers of the animal Machine, by adding or subtracting Motion to, or from either, or both, as it is found necessary; and in Regulating the Determination of the Motion in either, or both, as it is found wanting; and whereas the cold and hot Baths, when properly apply'd, serve as the most effectual safe Means for communicating Motion and Exercise to the animal Solids and Fluids, upon which Account it is that they acquire a superior Excellency and Power preferable to all other Remedies in the Cure of many Diseases; for during the Time of Bathing the whole elastick vascular System being strongly compressed by the Weight of the Water, which according to this new improv'd Method of Bathing may be apply'd in all Degrees and Quantities, and being stimulated by its Coldness at the same Time, has thereby a very great Quantity of Motion impress'd and communicated thereto; and by the alternate Oscillations and reciprocal Pulsations, that become produc'd thereby in the Solids and Fluids, the whole animal System becomes thereby thoroughly and intimately exercised in all its Parts, from the Circumference to the Center, and from the Center back to the Circumference, &c.

15. After what Manner the Body is affected by Bathing, may be more readily conceived by adverting to the little Picture or Figure of a Person, represented by Fig. 1. as standing erect and wholly immerg'd under Water, the external Surface of the Person's Body being express'd and defin'd by two parallel concentrick Lines; the outermost being one real continu'd Line, but the innermost a prick'd or discontinu'd Line, so that supposing the Surface of the Person's Body before going into the Bath, to be coincident with the outermost real Line; upon coming out of the Bath, the external Surface of his Body will be contracted by the Pressure and Stimulus of the Bath, and become coincident with the innermost dotted Line; and the intermediate Space between both Lines, serves to express the Quantity of the Expansion and Contraction of the Body, before and after Bathing; and during the whole Operation and Exercise thereof, the Body will continue to vibrate quickly and strongly, inwards and outwards, between the said two Lines, &c.

16. Moreover in this new Method of Bathing with hot Water, the same may be brought to any Degree of Heat from that of extreme Cold productive of Frost, to that of the greatest Degree of Heat consistent and compatible with animal Life, all which Degrees of Heat may be exactly regulated by observing the Thermometer, which Instrument becomes for that Reason a necessary Appendage of the Bathing Machine. Moreover the Water serving for the Bath may be variously prepared, compounded and impregnated with the Particles of Bodies of all Sorts, Animal, Vegetable, Mineral, Astringent, Relaxing, Stimulating, Anodine, Emollient, Digestive, Detensive, Sarcotick, Discutient, Odoriferous, Aromatick, &c. according to the various Cases and Intentions to be pursued in the several States and Periods of healing Wounds, Ulcers, Tumours, Inflammations, Gangrenes, and all other cutaneous Diseases. And besides, a Bath thus constructed and managed; may for a small Charge be fitted and prepar'd, so as to answer all the Ends of any of the most noted saline, chalybeate, and sulphurous natural Baths, either here at Home, or Abroad, by mixing the Water of the artificial Bath with Salts and Sulphurs, &c. like an Homogeneous, and in the like Proportions, as they are found to be in the said natural medicinal Water Baths.

17. Now as a farther Proof and Instance of the great Efficacy and healing Virtue of the Bath, we shall here briefly consider the Hydrophobia or the Bite of a mad Dog, or any other Animal, which is accompanied with one of the most frightful indomitable Distempers incident to Mankind: Now, in this Case, all Physicians, both antient and modern, unanimously agree in advising the Cold Bath, as the most effectual Cure; and moreover it is also observ'd, that the common Practice of Bathing with fresh Water, is not so beneficial, as Plunging or Diving to a considerable Depth in Salt Water; now all the Advantage (which is both real and considerable) that can be rationally propos'd and expected from this Practice of Plunging or sudden Immersion, more than from going into a common ordinary Bath, can only consist in the greater additional Weight and Pressure, allowing some part of the Effect to be owing to the Surprise which the Person is put into upon this sudden Immersion, which Surprise operates as a Stimulus. But upon considering for how very short a Time a Person can bear such Exercise of Living under Water, this Remedy, however the most efficacious of any hitherto known, yet is found to fail and miss of Success, and that chiefly for the two following Reasons, namely, the Want of a sufficient Weight and Pressure from the Water, (it not being practicable nor safe to place the Person at any great Depth therein) and from his not being in a Condition of holding out or continuing under the Operation and Influence of such an additional Pressure, for a Time reasonable to effect and produce the Changes and Alterations necessary to subdue and expel the Poison out of his Body. But now both these material Objections are wholly remov'd by this new improv'd Method of Bathing, as describ'd in the preceding Numbers, wherein it has been shewn how a Person may be made to sustain any Quantity of Pressure from the Water in the Bathing Vessel, from that of one Foot, to that of a hundred or a thousand perpendicular Feet of Water, if requir'd, and the Person put in a Condition withal to continue under the mechanical Effects of that Pressure for any Time, that may be judg'd necessary for answering all the curative In-

tentions that can be produced or expected therefrom. And moreover, the Water in the Bathing Vessel may be render'd not only of all Degrees of Saltnefs, &c. but the Person by letting himself drop or fall suddenly from off his springing pendulous Chair, down into the Water, will thereupon receive all the farther good Effects and Benefit arising from the increas'd Saltnefs and specifick Gravity of the Water, together with that produced by the Surprize and Fright, from this sudden Immersion, which operates first upon his Imagination, and by necessary Consent has the Effect of a universal Stimulus, by bringing the whole System of the Nerves and Solids into a State of Contraction. What great and mighty Changes may then be effected by submitting the humane Body, consisting of a System of elastick compressible Tubes and Fluids, to such great and variable Quantities of Pressure, and that for such a Space of Time as is requisite to obtain all the salutary Effects of so powerful and efficacious a Remedy, are so obvious and manifest from the Laws and Mechanism of the Animal Machine, as not to need being more particularly detail'd and insisted on. And I am humbly of Opinion, that by a judicious Use of this new mechanical Method of Bathing, join'd and assisted by some other new mechanical Methods of applying the Air to the humane Body (as may be found describ'd in the second, third, fourth and fifth Chapters following) that the most obstinate deplorable Cases of this Distemper, even when arriv'd at its worst and fatal Period and distinguishing Symptom the Hydrophobia, together with all other Diseases of the like rebellious Disposition, may be conquer'd and brought to capitulate and surrender. But it must be remember'd withal at the same Time, that all Remedies as are of such sovereign Virtue and Efficacy in the Cure of Diseases, the very same by an injudicious ill-timed Use and Application, become as certainly the Instruments and Causes of many Distempers, oftentimes much worse than those they were intended to cure; however this Imperfection and Objection is no ways to be charg'd to Bathing any more than to other Remedies; but is wholly owing to Ignorance and Want of Judgment in directing the proper Use and Application thereof; the true Knowledge whereof requires the soundest Judgment, greatest Experience, and most perfect Acquaintance with the Animal Œconomy; and this hath been the chief Reason why Bathing hath miscarry'd in many Cases, and thereby brought this most noble sovereign Remedy so much into Disuse and Disrepute.

18. And I farther humbly think it demonstrable from the Laws of Animal Mechanism, that by this new Method of applying the cold and hot Baths, together with the Use of the Vapour-Baths, both humid or dry, simple or compound, with the Method of topical Baths, as describ'd in the sixth and eighth Chapters; which being join'd and assisted by the other Methods of applying the Air, &c. to the humane Body, as may be found describ'd in the second, fifth, sixth and eighth Chapters; that all the several Degrees, Stages and Symptoms of the venereal Distemper, with all other cutaneous Diseases, even those of the most untractable Disposition, as the Leprosy, &c. may be more certainly, safely and speedily cured, than by any other Remedies whatsoever. And however Mercury has obtain'd the Preference in the Cure of the above Diseases, I am nevertheless to a Demonstration persuaded, that this liquid Fossil consider'd either as exhibited crude, or as it is variously prepar'd and transform'd by Chemistry, that neither it nor any Medicines of the mineral Tribe, and such as have thus undergone and been put to the Rack, Torture and fiery Inquisition, and are only the forc'd casual sportive Productions of strong artificial Fires, such as are the Medicines of the chemical Pharmacy, that the same were never design'd nor intended by the Author of Nature, as proper Remedies for curing the Distempers of Animal Bodies, as having no manner of Affinity, Congruity and Agreement with the Principles which compose Animal Bodies; which as they require to be repair'd and nourish'd by Principles homogeneous and analagous with those from which they were originally form'd; so their Diseases can only be radically cured by Principles contrary to those by which they were produc'd. For had Mercury any such real specifick Virtue for the Cure of Diseases, it may be reasonably concluded, that Providence would have rendered the Generation and Growth of Mercury as common and easy to be come at, as are the other great cardinal Catholick Remedies of Nature, namely, Aliment, Water, Air, &c. which we find to be universally dispens'd and distributed to all Mankind, and that pretty equally and alike; whereas we find Mercury but of rare Growth, and only the Produce of some remote barren Countries, and lodged deep in the Bowels of the Earth, as it were to keep Mankind from coming at the Knowledge thereof; I think therefore that it will be readily allow'd by every unprejudic'd disinterested Person, that neither Chemistry nor Mercury, which makes the chief Subject of that Art, tho' both must be allow'd to be of great and extensive Use when apply'd to their proper Ends, that is, to the Improvement of the mechanical mercantile Arts, Manufactures and Trades, and also to natural experimental Philosophy; yet neither the one nor the other have ever done, nor are ever like to do any real Service to Physick or the Practice of Healing, since they have been apply'd thereto, which is but of modern Date. And moreover all the chemical Processes and Preparations of Mercury by Fire, appear rather to endow it with noxious than healing Qualities, as becoming thereby arm'd and absorb'd with so much concentrated Fire and saline Spiculæ, &c. as to be render'd fitted like so many edg'd Tools to tear, rend and destroy the Texture of the Solids; and this we shall always find to be the natural Effect of all such Medicines. And however, upon the Use and Application of Mercury in the aforesaid Distempers, the Symptoms may be conquer'd, and the Lentor, Viscidity and saline State of the Blood become attenuated

nuated and dissolv'd, by the great specifick Gravity, Subtility, Attraction and Momentum of the mercurial Particles, by which the saline venereal Particles being broke, attracted and absorb'd, are carry'd out of the Blood along with the mercurial Particles, when render'd commiscible with the Blood, either by internal or external Application. But now at the same Time it remains to be consider'd, that those very Properties whereby the Mercury becomes capable to produce those good Effects upon the animal Fluids, namely, its specifick Gravity, Fluidity, Attraction, Momentum, empowers it at the same Time to do a much greater Injury and Damage to the animal Solids, by dissolving the Cohesion and Texture of the small original Machinulæ, serving to compose the first elementary linear Solids and Fibres, and by dividing and setting them at too great a Distance from each other, must so much weaken the Attraction of Cohesion between them as to become ever after irreparable. The Truth whereof is abundantly confirm'd from daily Observation as Matter of Fact, that such Persons as have undergone such mercurial Courses, Salivations, &c. though they may find the System of their Fluids apparently mended thereby for a Time, yet will find the System of their Solids ever afterwards under a declining State; so that in reality all those Reliefs obtain'd by the Use of Mercury, are not only transient, deceitful and apparent, but are moreover the Cause, and lay a sure Foundation for future Diseases, much worse than those they were design'd to cure. And thus it may be remark'd, that such Persons as have had their Constitutions thus rack'd with Mercurials generally fall into a wasting tabid State as to their Solids, whence Consumptions, universal and partial Atrophies, Dropsies, &c. ensue as the natural Consequence. And furthermore, that Mercury is really inimical to and incompatible with animal Life, is abundantly manifest from the deleterious fatal Effects which it is constantly observ'd to have upon such as are conversant therewith, such as the Persons who are condemn'd for to work in the Mines, and in purifying the same; who all without Exception die in a short Time, being generally seiz'd with universal Tremors, Palfies, Hecticks, Salivations, &c. all which serve plainly to discover its predatory deleterious Effects upon the animal Solids.

19. From what has been remark'd in the preceding Number, we may deduce this fundamental Rule and Caution for to direct to Practice; That as the Solids are the principal Part upon which the Stability, Health and Duration of the animal Machine chiefly depends; That in Curing the Diseases of the Fluids, we don't at the same Time weaken and impair the Solids; which will be making the Remedy worse than the Distemper, or removing one Disease to make way for another much worse: The Diseases of the Solids, which consist chiefly in there being either too elastick and tense, or too weak and relax'd, being much more difficult to cure than those of the Fluids. Many fatal Mistakes and Miscarriages may be met with in Practice by not duly adverting to this fundamental Rule, and particularly in the Cure of the venereal Distemper, and cutaneous Diseases, &c. which are generally suppos'd to have their Origin from a depraved State of the Fluids, in the Cure whereof the System of the Solids is frequently spoil'd and destroy'd by nauseous Loads of internal Medicines of all Sorts, Emeticks, Catharticks, Alteratives, Specificks, and especially Mercurials, continued for a long Time to mend and correct the Errors of the Fluids, at the Expence and Damage of the Solids.

20. The humane Body may not improperly be consider'd as a Cylinder, composed of an infinite Number of longitudinal and transversal Tubes, fill'd with Fluids, all communicating with one another, as also with one remarkable large Vessel open at both Ends, namely, the Stomach, with its Appendages the Oesophagus and Intestines, placed about the Middle or Axis of this Cylinder. This being granted, as no Change can be produced in this System but by some Motion impress'd and communicated thereto, it remains to be determin'd, which appears the most natural, efficacious, safe, universal Method for communicating Motion and producing any general Change in such a System of elastick compressible Vessels and Fluids. Now there are two Ways for solving this Problem; the First, and what is now mostly practis'd, is by cramming down a Number of Medicines of all Sorts into this central Canal the Stomach, the Effects of which Medicines either upon the said Canal, or the other Glands, can never certainly be determined. Or Secondly, whether all such Changes and Intentions as may be wanting, may not be more certainly, safely and universally effected by applying an equable uniform Pressure, &c. of a proper Quantity, and for a reasonable Time, externally to this compressible vascular System, either by means of Air or Water. Now this latter Method is what I undertake to demonstrate in the several Parts of this Treatise, as the most perfect and eligible; wherein I think I may appeal to the Example of Nature, in all the several Stages and Gradations of animal Life; besides the irrefragable Testimony and Evidence of Experience and Facts; it being to this Principle only, that all the salutary Effects of that most noble Remedy the Bath are wholly owing.

C H A P. II.

General Observations relating to the mechanical Effects of the Air, consider'd as apply'd and operating upon the whole external humane Body; with the Construction and Description of a new artificial Atmosphere or Air-Bath, whereby the Air, that universal Cause and Instrument of animal Life, Health and Diseases, may be made to operate upon the humane Body, with all its Properties and Qualities chang'd and regulated in all Degrees and Proportions, &c. whereby all the same curative Intentions and salutary Effects may be obtain'd, that can be had from Bathing either in cold or hot Water; together with many peculiar Advantages ensuing from this new Method, that can't possibly be obtain'd from the common Way of Bathing in Water, the Practice whereof may become wholly superseded by this new Air-Bath; which may with great Advantage be substituted in its Room, as being more universal, useful, commodious and applicable in most Cases and Diseases. Which Air-Bath affords all the Benefit that can be had from a Vapour-Bath, either humid or dry, in such wise that it will prove the most universal, safe and sovereign Method for the Preservation of Health, with the Cure of Diseases, &c.

1. **B**EFORE I proceed to describe the Construction and Uses of this new Machine or Air-Bath, in order for to open up and prepare the Way for a more distinct clear Perception of its Uses, I shall first briefly consider some of the principal known Properties and Qualities of the Air, with their relation to, and mechanical Influence and Effects upon Animal Bodies.

2. The humane Body being a perfect pneumatico-hydraulick Machine, composed of two general Principles the Solids and Fluids; all the vital Motions and Functions of which complex Machine are effected and continued by three general principal Powers: The first, is the muscular moving Force of the animal Solids; The second, is the Pressure, &c. of an elastick Fluid, as the Air or Atmosphere, acting outwardly upon the whole external Body, as also upon the Lungs, and inwardly within the Cavities of the Thorax, Abdomen, Stomach, and intestinal Tube, &c. The third, is the animal Fluids. Now the Solids (by which I mean not only the Heart, with the arterial and venal Systems, but likewise all the Organs and Muscles serving to Respiration), together with the Pressure both of the external and internal Air, are the two joint proper moving Forces and Powers apply'd for circulating and giving Motion to the Fluids; which in this Case may be consider'd as the Resistance to be mov'd or surmounted. When therefore those three Powers have their respective Forces and Momentums harmoniously adjusted, allied and proportion'd to each other, all the vital Movements, Operations and Functions of the animal Machine will be regularly executed; but, on the contrary, when the said Powers happen to be relatively disproportionate to each other, its Motions will thereupon become disturb'd and irregularly perform'd accordingly. And moreover as one of those Powers, namely, the Air, is ever changing in its Properties and Qualities, the other two Powers, namely, the animal Solids and Fluids, or the whole animal Machine, will become thereby necessarily determin'd and subjected to the like perpetual Changes likewise, tending either towards Health or Sickness.

3. The Bodies of Animals being vascular compressible Machines, are, from their first Conception and Generation to their final Corruption and Dissolution, to be conceiv'd as cast or inclosed within a Mould or Case, either of Air alone, or of Air and some other Fluid: Thus the humane Body in its first Conception and antenatalital State is inclosed in the uterine Fluids, as in a soft warm yielding Mould, until it has acquir'd sufficient Firmness and Strength to bear the external Air; but from the Time of its Birth to its Death, it becomes immerg'd, closely wrap'd up and envelop'd round with Air as in a fluid elastick Mould, Vehicle, or universal Bandage. Now if we consider the Properties and Qualities of this aerial Mould or Vehicle, together with those of the humane Body inclos'd therein, we shall find that whatever Changes or Alterations are produced, and whether the same begin first in the circumscribing Air-Mould, or in the Body contain'd therein, that the like equal Changes will be produc'd in both, and at the very same Time. Again, the humane Body with this its aerial Mould or circumscribing Sphere of Air, are to be consider'd as two opposite antagonist Powers or Muscles, acting with contrary Forces and Directions upon one another, and whichsoever prevails, the other yields and gives way, both being eminently elastick. The humane Body consisting of an Assemblage or System of elastick, contractile and distractile Tubes, infinite in Number, through which the Blood, which is a very complex Fluid, evermore permanently warm in some Degree, and subject to be greatly rarefied and condensed by Heat and Cold, continues for to circulate during Life. Again, this circumscribing Mould or Sphere of Air, every where surrounding this animated Body, being likewise eminently endow'd with the Properties of Fluidity, Gravity, Elasticity, Pressure, Attraction, with the Qualities of Heat, Cold, Humidity, Dryness, Exhalations, Motion, &c. in respect to

all which Properties and Qualities it undergoes great, frequent, and oftentimes sudden Changes from one Extream to another. The humane Body, with this its circumscribing Mould or Vehicle of Air, being thus mutually and inseparably allied and combin'd together, during the whole Period of its Existence, the same becomes by necessary Consent reciprocally affected with the Changes produced in each other, like as the Soul and Body mutually participate and become alike affected with the Changes and Alterations of each other. And thus, if the Air-Mould by what Causes soever be render'd heavier, the whole elastick Animal System inclosed therein, being press'd upon by a new additional Weight, will yield and give Way thereto, and by contracting itself inwards every Way towards its Center or Axis, will become reduc'd into less Space and Dimensions. And, on the other Hand, as this Aerial Mould become less Dense and Lighter, from what Causes soever, the whole elastick vascular System, by a contrary Nifus and Restitutive Force, will thereupon expand from its Axis or Center outwards into larger Dimensions, until the elastick Power and Refort of the Body, and that of its circumscribing Air-Mould come to counterballance each other. Suppose again, that this Aerial Mould comes to have a greater Degree of Heat and Rarefaction communicated thereto from what Causes soever, whereby its Elasticity and Pressure being diminish'd, the animal Machine being in this Case less press'd upon, will have Liberty to dilate and unfold, and stretching its containing Mould outwards, will acquire larger Dimensions, until that the Spring and Force of the Body comes to be counterballanced by the Resistance of its Mould; as on the contrary, when the Air-Mould comes to be condens'd by Cold, &c. By its greater Stimulus, Stricture and Pressure upon the Body the same will become reduc'd to less Dimensions; the Air-Mould becoming at the same Time equally contracted in its Dimensions: And thus, whatever Alterations are produc'd in this circumscribing Air-Mould, either in Respect of its Gravity, Elasticity, Heat, Cold, Humidity, Dryness, Motion, Attraction, Effluvia, &c. the like Alterations will be produc'd at the same Time in the animal Machine, both in the Solids and Fluids; and whether the Change be supposed to begin first in the Air-Mould, or in the animal Body inclos'd therein, the Effect and Alteration will still be equal, and produc'd at the same Time in both; the one becoming always necessarily contracted or expanded; heated or cool'd; rarefied or condens'd, &c. equally, and at the very same Time with the other.

4. The Air then consider'd, as endow'd with the aforesaid variable Properties and Qualities, is the principal Agent and Instrument of Nature in all the Operations and Productions in and upon this terrestrial Globe; and so great is the Necessity of having such an elastick, changeable, fluid Mould of Air to envelope and surround every where the animal System, from the very first Time of its Conception and Existence, to its final Dissolution, in order to sustain and keep the whole System together, and to excite, maintain, and keep up a constant Oscillation, Motion, Heat, and State of Exercise in the animal Solids and Fluids, that without it no Animal nor Vegetable, &c. could ever be produced, live or grow; and it is by the Air, in Conjunction with the other elementary Principle Fire, that the Generation, Accretion and Corruption of all Bodies is effected and brought about. And the animal Machine, during the whole Time of existing and living, being closely embrac'd every where by this Aerial Mould, which, by compressing the same equally with a certain determinate, but variable Degrees of Pressure, by which equable Resistance and Pressure the animal Solids and Fluids becomes not only sustained thereby, as by a soft, universal, elastick Bandage, but have Liberty given them also to unfold, develope, and grow gradually; and, thus the animal System will continue to grow and increase in Bulk and Strength to a certain determin'd, limited State, and no further; and this State, respecting the Period and Termination of its Growth, depends upon the innate Degree of Cohesion, Strength and Firmness, wherewith the original, Elementary, Stamina and Solids were first endow'd; For as soon as the Pressure and Resistance of this Air-Mould, (when at its least Quantity) becomes able to counterpoise the Spring and Force wherewith the animal Solids endeavour to expand and develope themselves, then every Animal is arrived at its full State and Growth, it not being in the Power of humane Art to carry it on further, to any higher Degree of Perfection; and from this Period, when the animal Solids become unable to dilate and stretch out their circumscribing Sphere or Air-Mould further, a full and final Stop becomes thereupon put to the further Growth and Elongation of the Solids; and from that Period of Time, the Force and Elasticity of the Solids continually decreasing, and the aerial Mould still continuing to act thereupon with the same variable Degrees of Pressure, &c. This elastick Fluid Air-Mould will ever afterwards be gaining the Ascendent and Prevalence over the animal Solids, and will be continually reducing the same into a narrower Compass; all or most of the small capillary Vessels becoming impervious and obstructed, and the whole nervous, muscular, membranous System at last emaciated and reduced to an almost bony Rigidity; as may be seen in the Decline of Life and Approaches towards old Age; until the Pressure and Resistance of the Air-Mould puts a total Stop to the Circulation of the Blood, and to the Life of the Animal. Thus then we see how the animal Machine has its several Periods and States of increasing and decreasing, with its final Corruption and Dissolution, all regulated and unalterably determin'd by this elastick changeable Fluid the Air.

5. Now, as the Air is thus so absolutely necessary to the Existence and Continuance of all Degrees of animal and vegetable Life; so on the other Hand, we shall find the same to be for the most Part the true general Productive Cause of all or most of the Diseases incident to Mankind, &c.

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That the Air is a Cause adequate and sufficient of itself alone for producing all Manner of Diseases, will readily appear from considering its Properties and Qualities, with their mechanical Effects and Influence upon animal Bodies; the Atmosphere then being a Fluid eminently endow'd with Gravity and Elasticity, the same becomes subject to perpetual Agitations and Changes of Ebbing and Flowing alternately, and that at the same Time, and from the very same Causes, whereby the Tides are produced in the Ocean; by which alternate Changes thus regularly produc'd each Day in the Atmosphere, the Bodies of Animals immerg'd therein, must become subject to constant Periodical Changes and Alterations, and be variously affected thereby, as has been fully demonstrated by the celebrated and learned Dr. *Mead*, in his Book *de Imperio Solis & Lunæ in Corpora Animalium*. Moreover, besides the Alterations caused in the Atmosphere by the joint Gravitation and Attraction of the Sun and Moon, the same has its Gravity and Pressure very much alter'd by the Winds, with the Degrees of Heat, Cold, Humidity, &c. in such wise, that the Air in the same Place will oftentimes differ one Tenth Part in Density and Weight; in which Case the Difference of its Pressure upon a Person of an ordinary mean Size will be equal to 3600 Pounds weight; which great Differences of Pressure must produce very great Differences in the Tension of the Solids, and Expansion of the Fluids in a Humane Body; in the Case of a greater Weight, the Fibres being more strongly brac'd, and the Fluids more condens'd. Moreover as Heat and Cold are two universal powerful Causes and Instruments of Nature; and as the Atmosphere admits of great Variations in respect to those two Qualities, and that oftentimes suddenly from one Extream to another, upon which Accounts it becomes capable of producing very great and sudden Alterations in the Solids and Fluids of animal Bodies; which sudden Translations from one extreme State to the other, is generally the productive Cause of many great and epidemical Distempers. Again, the Atmosphere, being consider'd as always subject to great Changes, in Respect to the Degrees of Humidity and Dryness, becomes also upon that Account capable of producing very great Alterations in the animal Solids and Fluids, with Respect to their Tension and Relaxation. Again, as the Atmosphere becomes agitated by Winds, Tempests, Earthquakes, Thunder, Lightning, subterraneous Fires, &c. it may from all those Causes become capable of producing many morbid Impressions upon animal Bodies. Moreover, as the Atmosphere may be consider'd as a general Chaos or Menstruum, absorbed and impregnated with Effluvia and Vapours, continually rising, exhaling and circulating therein, from all Kinds of Bodies, by the Action of the cœlestial and subterraneous Heat, the same must also upon that Account become capable of producing very great and general Effects, and morbid Dispositions in animal Bodies, according as it abounds more or less with animal, vegetable, sulphureous, saline, and other such heterogeneous Exhalations. The Bodies of Animals then consisting of a Congeries or System of elastick Vessels, fill'd with Fluids subject to great Degrees of Rarefaction and Condensation, the same must necessarily become subject to perpetual and great Alterations, by being always immerg'd into, and encompass'd round with such an elastick Fluid Medium as the Air, subject to such frequent, great and sudden Mutations; in such Manner that every the least Change either in its Gravity, Elasticity, Pressure, Heat, Cold, Moisture, Dryness, Motion, Effluvia, &c. produces a proportional Change and Effect upon the animal Machine, in like Manner as in a Barometer, Thermometer, and Hygrometer.

6. The Mechanical Effects of the Air upon animal Bodies as before describ'd, may be illustrated and conceiv'd more readily by a Linear Representation and Draught, such as *Fig. 1. Plate 1.* wherein is shewn the Picture, Image, or Section of a humane Body, standing erect and naked in the open Air, the contour and external Surface of the Body being defined and circumscribed by two parallel concentrick Lines, the outmost whereof is one real continued Line, but the innermost is a prick'd or discontinued Line, which two parallel Lines are intended to represent the different Effects and Alterations produc'd in the Dimensions of the Body, by the variable Properties and Qualities of the Atmosphere. Thus, when the Air is lightest, the whole Body will thereupon dilate and expand its external Surface, becoming coincident with the outermost real Line; but when the Air is heaviest, the whole Body will become condensed and contracted in its Dimensions, so that its external Surface may now be conceived as coincident with the innermost prick'd or dotted Line. And as the Gravity of the Atmosphere is ever changing between those two Extreams, the Body will be kept in a continual State of dilating and contracting, or vibrating and oscillating, like to a Pair of Bellows, between the outermost real Line and the innermost discontinued one; and that from this one variable Property of the Air's Gravity alone; but if we take into the Account its other Properties and Qualities, which are also ever changing, as its Heat, Cold, Stimulation, Motion, Dryness, Humidity, Effluvia, &c. each whereof have a distinct, independent Action and Influence upon the Body, we shall find the same still subject to much greater Changes, than what it is by means of the variable Gravity of the Air alone, according as more or fewer of the said general Causes conspire and co-operate together. By which we plainly see, that as all the Properties and Qualities of the Air are ever changing, the human Body can never be one Moment at Rest, nor of the same Dimensions, but is kept ever expanding and contracting, and in a State of perpetual Motion and Exercise, from the Time of its Conception, to its final Dissolution; without which constant variable Motion and Exercise thus communicated to the whole animal Machine by the Causes aforesaid, no Animal could ever be produced, live, grow, or have its Parts duly formed and shaped, so that the Air serves both as a universal Bandage, to sustain the animal Solids from being
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destroy'd and broke to Pieces by the distending Force of the rarefied heated Fluids; and likewise as a universal Ferment, whereby both the Solids and Fluids are kept in constant Motion and Exercise.

7. The Air then consider'd as operating continually with its aforesaid variable Properties and Qualities, has so great and universal an Influence in the Production of Diseases, that it were an easy Matter to demonstrate (were it not too tedious here, and withal too evident) how all the general, original, morbid Constitutions and Diseases, both of the animal Solids and Fluids, may be naturally produced therefrom. How greatly then does it concern every Person, but more especially the Physician, carefully to observe and remark, when, and in what Degrees, and for what Continuance of Time, those Alterations happen, with the Effects and Consequences thereof upon animal Bodies. This Doctrine relating to the Changes, Alternations and Combinations of the Properties and Qualities of the Air, with their Effects upon humane Bodies, we find recommended by the best Physicians in all Ages, as the fundamental Rule of true rational Practice, and particularly the great *Hippocrates*, who tells us, that the Change of Seasons are the most effectual Causes and Parent of Diseases; and as daily Experience confirms the Truth hereof, it follows, that there is not any thing in Nature of such Importance, both as to the Production, and likewise to the Cure of Diseases, as a thorough Acquaintance and Knowledge of the different States and Constitutions of the Air; there being no Distemper but what may derive its Original from, or owe its Growth to the Changes, Alternations and Combinations of its several Properties and Qualities as aforesaid. This Truth we find also confirm'd from the Testimony of that industrious and accurate Observer Doctor *Sydenham*, in his History of Epidemick Constitutions of the Air; as also by Doctor *Wintringham's* Epidemick History of Diseases in the City of *York*, from the Year 1715, to 1725. And this Doctrine we find farther confirm'd and prosecuted by several others, and particularly by a Society of Gentlemen of the Faculty at *Edinburgh*, who have for some Years kept a meteorological Register or Journal of the Weather at the said Place, with the reigning popular Diseases consequent thereupon. And if this laudable Plan and Design was but carefully prosecuted for a sufficient Time, the Physiology of the Air, with the Distempers depending thereon, might be reduced to a Science, so as to be able to predict and foretel what Diseases must follow from the different States and Constitutions of the Air, and Seasons of the Year. But there is no Occasion to appeal to those, or any other Authorities, as the Truth hereof is obvious to every common Observer, how that certain Diseases keep Time exactly as to their Appearance, Periods, and Disappearance, and revolve as it were periodically, with the great cardinal Periods and Seasons of the Year: And thus we find the Spring, Summer, Autumn, and Winter, each productive of such Distempers, as may be naturally and evidently derived and produced from the reigning prevailing Constitution of the Air at those several Seasons, in respect to its greater or less Weight, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, Motion, &c. and in the several other intermediate Seasons, the Diseases are only so many Gradations or different Degrees from those, which prevail chiefly about the four cardinal Seasons.

8. From so many Observations and Authorities, with many other Arguments that might be produced in Support of this Doctrine, it may be concluded for a certain Truth and physical Aphorism, That all or most of the capital Diseases are produced immediately from the aforesaid mechanical Properties and Qualities of the Air, with their several Alternations, Changes and Combinations; and as the Air is thus the productive Cause of all or most of the distinct original Distempers, so the same Air when judiciously apply'd and made to operate upon the Body with Properties and Qualities contrary to those by which the said Distempers were produced, will prove the most natural Remedy for Curing the same. For according to the old Maxim, *Sublatâ Causâ & tollitur Effectus*, or which comes to the same Thing, Diseases must ever be cured by Causes contrary to those by which they were produced. And thus, for Instance, if the Distemper be owing to the Air's being relatively too light; the changing it for one more heavy, either so by Nature, or Art, will prove the only natural, certain, safe Cure. But if the Disease be caus'd by the Air's being relatively too heavy, it must be chang'd for one more light, render'd so either by Nature, or Art, in order to obtain a perfect Cure. If the Disease be the Effect of the Air's being too rare, it must be chang'd for one more dense and elastick. But if the Disease be occasion'd from the Air's being relatively too dense and elastick, it ought to be chang'd for one more rare. And if the Disease proceed from the Air's being relatively too hot, it must be chang'd for one more temperate and cool: And if to an Air too cold, it must be chang'd for one more warm. If the Disease be owing to the Air's being relatively too humid and damp, it ought to be chang'd for one more dry and serene. If the Distemper proceed from the Air's being impregnated with Effluvia or Vapours of any Kind, animal, vegetable, sulphureous, saline, &c. it ought to be chang'd for one more pure, open, perslated and serene; or that is impregnated with Effluvia and Exhalations of a contrary Quality, in order to obtain a perfect Cure. And so for all other Alternations and Combinations of the Properties and Qualities of the Air.

9. The Air having then such a constant necessary Influence and Dominion over the Life, Health, and Diseases of Mankind, it is astonishing that the same is so little regarded and attended to in the Practice of Physick, this Neglect appears owing to two Reasons: The First is, that Physicians consider the Air among those Things which cannot be forborn, and which they have
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not in their Power to alter, change, direct and apply, as they do other Medicines, by exact Doses, Weight and Measure. A second Reason appears to be, that the Air being look'd upon as common and obvious to every Person's Observation, Physicians think their Judgment and Directions in this Respect, would be as little regarded, as it commonly is, although very unjustly, with respect to Aliment, wherein every Nurse thinks her Judgment as good as the Physician's. But I shall shew both those Reasons to be wrong and ill grounded; and with respect to the first I shall endeavour to prove the contrary, by shewing that the Air may be apply'd and directed for to operate with all its Properties and Qualities either universally upon the whole Body, or topically and locally upon some Region or Member only, in the same Manner as other Medicines which are exhibited by exact Doses, Weight, and Measure. So that as the Air is on all Hands allow'd for to be the general productive Cause of Diseases, so the very same Air when apply'd and made to operate upon the Body with Properties and Qualities contrary to those by which the said Diseases were produc'd (as I shall shew may be done in this, and the following Chapters) will become the most universal, safe and perfect Remedy for curing all the said Diseases. And as for the second Reason before alledg'd, why the Air has been so little attended to in the modern Practice of Physick, the same is equally groundless and frivolous as the first, for as the Air is the primary productive Cause of Diseases, as has been already shewn, and as the same Air is the most efficacious, universal Remedy for curing them, as I shall shew in the Sequel; consequently there is no one Subject that will require so great a Strength of Judgment, and true experimental physical Knowledge, so as rightly to discern when, in what Quantities, and for what Continuance of Time, &c. to apply this Remedy to the Body, by causing it to operate thereupon with its Properties and Qualities chang'd and adjusted in all Quantities and Degrees, as may best answer the Intentions of Cure; the Knowledge of which Particulars no one can ever be Master of, without a perfect Acquaintance with natural Experimental Philosophy, the Physiology of the Air, and the Laws of the Animal Œconomy, &c.

10. Having shewn what great and universal Changes may be produc'd in the Animal Œconomy by the new Method of Bathing, as describ'd in the first Chapter, which when properly apply'd will serve to effect all the principal Intentions that can be obtain'd from any other Medicines. Now as this great Efficacy of the Bath is chiefly owing to the additional Weight and Pressure that becomes thereby laid upon the Body; there is however this great and unavoidable Inconvenience, attending the Use of the Bath, that in order to receive the Benefit from having such additional Weight laid upon the Body, a Person must for that Purpose submit his Body to be immerg'd in Water, either Cold or Hot; if in cold Water, he can't continue therein by reason of its disagreeable Stimulus for a Time sufficient to receive the Benefit and salutary Effects that may be propos'd and obtain'd from such an additional Pressure apply'd to his Body, and that for a longer Time. And if the Person commits his Body to hot Water, as the same causes so sudden and great a Relaxation of the whole external Habit, with such a plentiful Derivation of the Fluids outwards that he can't stay therein neither for any considerable Time, so as to receive all the Advantages that might otherwise be obtain'd, by continuing for a longer Time under the Effects of such an additional Pressure; for which Reasons the healing Virtue and Efficacy both of the cold and hot Water Baths becomes in a great measure lost and confined within very narrow Bounds.

11. If therefore a Method can be found for laying an additional Pressure of any assign'd Quantity equally upon the whole Body, and putting the Person withal into a Condition to continue under the Influence and Effects of such an universal equable additional Pressure, for any Time requir'd to obtain all the Benefits propos'd thereby; such a Method and Practice would be of infinite Use for preserving Health, and curing of Diseases. Now I humbly think that I have found such a Method that will fully answer all the Ends and Intentions above propos'd; and that is by applying and making Use of Air instead of Water, for communicating this additional Pressure to the Body. In what Manner this compressing Air-Bath or artificial Atmosphere is to be constructed, may be readily understood by referring to the vertical Section Fig. 4. with the horizontal Section, Fig. 5. agreeing therewith in Plate 1. if compared with what has been said in Numbers 6, 7, 8, 9, 10, &c. of Chap. 1. Thus the aerial Bathing Vessel B B B B, (which is constructed in the same Manner with that describ'd in the aforesaid Numbers referr'd to) is represented with the Image Picture or Section of a humane Body sitting therein (or standing as there is Occasion) a a a a is the Pneumatick Engine serving to condense or rarefy the Air in the Bathing Vessel, until it is of the Density and Pressure requir'd, and as is judg'd will suit best with the particular Symptoms and Indications of the Person's Case; so that by this Pneumatick Engine the Air in the Bathing Vessel may be condens'd or rarefied, so as to make it operate upon the Person's Body with any Degree of Pressure intended. And whilst he is inclosed in the Bathing Vessel or artificial Atmosphere, may either respire with the common external Air, by holding the End of a flexible membranous leather Pipe r a in his Mouth, or he may breathe with the Air in the Bathing Vessel, (without using any such respiring Pipe as r a) which Air as it becomes render'd unfit for Respiration, by the Heat and Steam exhaling from the Person's Lungs and Body, may be let out thro' the Vent pipe y y, and when the Bathing Vessel is thoroughly ventilated and purg'd of all the corrupt Air, the same may from Time to Time be replenish'd anew with fresh Air, of the same Density and Pressure as at first, and so successively, which State of the Air, as to its Density and Pressure, may be exactly regulated by the mercurial gage Pipe b b, with its annex'd Scale. Or

the Person may be supply'd with Air for Respiration out of the Vessel xxxx, join'd on to one side of the Bathing Vessel, the Air wherein may be brought to have the same Density with that incumbent upon the Person's Body in the Bathing Vessel, or any other Degree of Density as is found for to suit best with the State of his respiring Organs; all which several Parts and Appendages, belonging to the Bathing Vessel, with their Uses, will become readily understood by referring to the Description of the like Bathing Vessel in Numbers 6, 7, 8, 9, &c. of the First Chapter; (which Bathing Vessel was there intended to be used for Bathing with Water instead of Air) to which for Brevity I must here refer. Now the Person in this Bathing Vessel or artificial Atmosphere, may have the Air about him condens'd to any Degree requir'd, as suppose into double the Density of common Air, whereupon he will become subjected to an additional Pressure equal to about 40,000 Pounds Weight, which Quantity of Pressure is about twenty times greater than what any Person ever can receive by going into a common Water Bath; and this Condensation of the Air in the Bathing Vessel, may be carry'd still higher, so as to be render'd three, four or five times denser than the common external Air, in which Cases the Person will become subject to as great a Pressure from the Air, as if he was immerg'd to the Depths of 105, 140, or 175 Feet under Water, which is a Degree of Pressure above a hundred times greater, or more than what can be obtain'd from the common Practice of Bathing; and consequently where uniform Pressure is of Use, this new Method of applying it to the Body by means of Air, will be a hundred or a thousand times more successful, than what the common Practice of Bathing with Water is; which additional Weight and Pressure, as the same may be apply'd upon a Person's Body, in all Degrees and Quantities, the same will be capable, under a prudent and judicious Management, of producing the greatest Alterations both in the animal Solids and Fluids, and thereby become the most universal Cause, Instrument and Remedy for Curing the Diseases incident to humane Bodies.

12. If now the pneumatick Engine a a a a, be understood to be supply'd with two Pipes, each of which having a spiral Pipe or Worm joyn'd thereto, one of which Worms being put into a Vessel with cold Water or Refrigeratory, and the other in a Vessel of hot Water (neither of which two Worms, with their Vessels, are shewn in this Draught, to avoid incumbering the same too much, and as they may be readily conceiv'd without) each of those Worms has a Cock, whereby the Air may be let into the pneumatick Engine, either through the cold or hot Pipe or Worm, or out of both together: Thus upon shutting the Cock upon the Worm through which the hot Air is supply'd, and opening the Cock of the Worm, through which the cold Air is convey'd, the Bathing Vessel may be kept from Time to Time supply'd with fresh Air, which by passing through the several spiral Convolutions of the Worm, which being placed in a Refrigeratory fill'd with cold Water, impregnated with Sea Salt, or with Sal Armoniack, the Air may be render'd very cold thereby even in the Height of Summer; and the other Worm being placed in a Vessel of Water or Oil heated to all Degrees from a boiling Heat and downwards, the Air in passing through the spiral Revolutions of the Worm, may be made to receive different Degrees of Heat, so as in the Depth of Winter to be render'd as hot as in the Middle of Summer; so that the Person in the Bathing Vessel may have the Air not only condens'd and made to operate with any Degree of Pressure upon his Body, but have the same likewise fitted to act with all Degrees of Heat, from that which produces Freezing, upwards to the greatest natural Heat of the Air in Summer, or even further upon Occasion; all which Degrees of Heat thus communicated to the Air in the Bathing Vessel or artificial Atmosphere, may be exactly regulated and known by the Thermometer $\tau \tau$, with its annexed Scale.

13. By the foregoing Method this Air-Bath or artificial Atmosphere, besides the peculiar Property of having its Pressure render'd vastly greater, and capable of being varied in all Degrees, above that of a common Water Bath: It has moreover this other Property in common with the Water Baths, of being render'd either cold or hot, and that in different Degrees, as is found to answer best with the Indications of Cure. Now there is but one other Property wanting to render this Air-Bath or artificial Atmosphere possess'd of all the Properties and Qualities which the Water Baths have, either cold or hot; and that is the relaxing Quality residing in the Water: If now the pneumatick Engine a a a a, be supplied with a Quantity of Steam or aqueous Vapours, convey'd through a Pipe thereto from the Copper or Boyler v v v v, the said Vapours may be thrown in any Quantity into the Bathing Vessel, so as to communicate a sufficient Degree of Heat and Moisture to the Air inclosed therein; which Air-Bath or artificial Atmosphere will become thereby endow'd with all the Qualities necessary to warm, moisten and relax, as it shall be found wanted; so that this Air-Bath, besides the Properties peculiar to itself alone, has moreover all the other Qualities which the common Water Baths, cold or hot, are possess'd of.

14. Hitherto we have consider'd the Person in the Bathing Vessel or artificial Atmosphere as encompass'd round with condens'd Air, which by its additional Pressure, and being render'd cold withal, will cause a general Derivation of the Fluids towards the internal Parts, as the Intestines, Viscera, &c. so on the contrary, by exhausting the Air out of the Bathing Vessel in part, whereby the Pressure upon the Person's Body being diminish'd, which will give Liberty to the external Blood Vessels, &c. to evolve and dilate, and thereby cause a Revulsion of the Fluids from the central Parts, with a Derivation thereof to the external Surface of the Body.

15. There

15. There is moreover this very considerable Difference to be remark'd, between this new Air-Bath, and a Water-Bath, either cold or hot, namely, That let a Person place his Body in what Situation soever, and at what Depth under Water soever; yet as the Water is an unelastick incompressible Fluid, the additional Pressure will not be apply'd equally to all Parts of his Body; the Parts having a greater or less Pressure in proportion to their Depth under Water, the lowermost being more compress'd than the uppermost, which Inequality of Pressure will always produce a very irregular and unequal Derivation and Revulsion of the Fluids. But in this Air-Bath or artificial Atmosphere the Case is quite otherwise; for as the additional Pressure is communicated to the Person's Body by means of Air, which being an elastick compressible Fluid surrounding the whole Body, the Pressure will become thereby communicated and impress'd upon the whole external Surface of the Body equally and alike; so that the Derivation and Revulsion of the Fluids produc'd from this new Method of Bathing with Air, instead of Water, will be equable, regular and uniform.

16. Now in order to render this Air-Bath or artificial Atmosphere more universally useful, there may be added thereto as a necessary Appendage the Copper or Boyler *v v v v*, which Vessel is close shut with a Cover at top, with a Pipe *v p* solder'd on upon one side, the End whereof *v*, opens into the Copper, and the other End *p*, into the Pipe *p z*, the End whereof *p*, opens into the Bathing Vessel: The Pipe *p z* communicates also with the pneumatick Engine *a a a a*, by two short Pipes *s s*, and *f f*, (*vide* Plan, Fig. 5.) now this Copper *v v v v* is design'd for producing Vapours or Effluvia from all Sorts of Bodies, Animal, Vegetable, Fossil, Solids, or Fluids, serving for a Vapour Bath, either humid or dry; now we will first consider the Uses of this Machine as it serves for humid Vaporation or Irroration; for that Purpose the Copper being fill'd with the Ingredients from which the Vapours are to be generated, upon applying a proper Degree of Heat thereto, either that of Boiling Water, a Sand Heat, or by Attrition, Accension, &c. the Vapours will become raised to the upper Part of the Copper, and when collected in a proper Quantity, upon turning open the Cock of the Steam Pipe *v p*, the Vapours will issue at the Orifice *v*, and become discharg'd by the Orifice *p*, into the Bathing Vessel, until they are diffus'd throughout the same, and fully absorb'd and saturated therewith: Now the Materials from which those Vapours are produced, may be any animal, vegetable Substance, or any kind of Fluid, simple or compound, that is capable of emitting humid Vapours; of which Sort are common Water, Milk, Wine, Vinegar, Spirit of Wine, Urine, &c. together with the Compositions of the Shops as Distill'd Waters, Tinctures, Essences, Elixirs, Decoctions, Infusions, with all the Parts of Animals and Vegetables. The Vapours being thus rais'd in a sufficient Quantity, either by Ebullition, Accension, or Attrition, &c. and from Ingredients well chosen and proper to the Case and Intention; if now the Vapours be design'd to be apply'd universally and immediately to the whole Body, in that Case the Person may submit himself to the Influence thereof either sitting or standing with his Body naked; but if the Vapours are intended to be apply'd only to some particular Region or Part of the Body, in that Case the Person may be provided with a proper Covering, which like to a Case or Coat of Armour may fit close and tight, so as to secure all the rest of his Body from the Action of the Vapours, excepting the only ailing diseas'd Part; and after this Manner the Vapours may be directed and apply'd for Fumigating any particular Part of the Body in the most advantageous Manner. Which Method of Fumigating the Body, either universally or partially, will be found exceeding useful for the Cure of many Diseases and Ailments, and especially for cutaneous and venereal Cases and Disorders; by Humecting, Relaxing, Diluting, Discussing, Attracting, Opening, Cooling, Warming, Inspissating, Stimulating, Suppurating, &c. and moreover according to this Method of constructing and managing the Bath, a small Quantity of Materials will be sufficient to produce Vapours to answer all Intentions, by reason none of the Vapours are suffer'd to be lost or run to Waste; for when once the Air in the Bathing Vessel is properly impregnated therewith, a small Matter will serve to recruit the same, which can't be done so well any other Way, and in many Cases not without great Charge when the Ingredients are scarce and bear a high Price.

17. Having shewn how this Air Bath may be fitted and made to serve for a humid Vapour-Bath; now the very same Machine and Apparatus will serve equally for a dry vapourous Bath; in which Case the Effluvia or Exhalations are to be raised from dry Medicines, (which is all the Difference between the two Baths) either by Accension, Attrition, or the Application of a naked Fire or intense Heat; - which Effluvia or dry Vapours may be directed and made to operate either upon the whole external Body, or only upon some Region or Member thereof; as has been shewn in the preceding Number. Now the chief Ingredients for this Purpose are all dry Substances, Animal, Vegetable, Mineral, which being either volatile or inflammable, will emit dry Fumes or Effluvia; and the Materials serving to this End are very numerous, such as Resins, Gums, Gum-Resins, dry Balsams, Spices, Aromaticks, Galbanum, Labdanum, Affa-foetida, Castor, Styrax, Ambergrease, Tobacco, Camphir, Sulphur, Mercury, Cinnabar, Sal Ammoniack, Nitre, &c. the Ingredients being properly chosen for to answer the Intention, are to be put into the Vessel *v v v v*, and committed to a proper Degree of Heat, until the Fumes and Effluvia are raised in a sufficient Quantity, when upon opening the Steam Pipe *v p*, the Bathing Vessel will become fill'd with the Effluvia, which may be apply'd to the Body as before directed; and if

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the Effluvia have not Force enough to impregnate the Air in the Bathing Vessel or artificial Atmosphere sufficiently, and to such a Degree as may be desir'd, in that Case the Vapours or Effluvia may be first drawn off from the Steam Vessel v v v v, and made to pass into the pneumatick Engine a a a a, out of which they may be forc'd into the Bathing Vessel until the Air therein becomes saturated therewith in any Quantity requir'd; which Method of Fumigating the Body either universally or partially with dry Fumes or Vapours, produc'd from Ingredients well chosen and proper for the several general Intentions of Contracting, Relaxing, Resolving, Dissolving, Stimulating, &c. will prove of great Use in the Cure of many Diseases, &c.

18. Moreover this new aerial Bathing Machine or artificial Atmosphere, as the same has been describ'd in the former Numbers, appears to have all the Properties necessary and requisite to render it a commodious Machine for a Person to go through a general Diaphoresis or Sweating Course, by placing the Person naked therein, and giving the Air in the Bathing Vessel all the necessary Properties and Qualities, as to the Degrees of Heat, and its Impregnation with proper Effluvia and Vapours, &c. as are found to promote this general Intention and Evacuation by the cutaneous Glands; how this End may be best attain'd, may be understood by referring to the former Numbers.

19. The Person whilst inclos'd in this Air-Bath or artificial Atmosphere, with the Air condens'd about him, if it be found necessary and the Case requires it, instead of Breathing the common external Air, he may be furnished with Air for Respiration of the same Density with that incumbent upon his Body, or of any other Degree of Density and Elasticity as he finds suits best with his respiring Organs, by holding the End r, of a flexible membranous leather Pipe r a, in his Mouth, the other End whereof p opens into the respiring Vessel x x x x, out of which he may be constantly supply'd with fresh Air, and of any Density, &c. requir'd. All which will become better understood, by referring to what has already been said in the like Case in Number 9, of the First Chapter. Now the Air both in the Bathing Vessel, as also in the Respiring Vessel, is brought to have the Degrees of Density, &c. propos'd, by the pneumatick Engine a a a a; which Engine in this Section, Fig. 4. with its corresponding Plan, Fig. 5. is represented as work'd by the Force of Men pulling of Ropes, w 1, w 2, passing round the Groove in the Wheel w w, upon the upper Part of the Axis A A, of the Engine; but in the other Draught of the same Engine, Fig. 1, 2, 3, 6, &c. the same is work'd by Men with Capstane Bars fix'd into a Tympanum or Drum-head upon the upper End of the Axis A A; by either of which Methods a Power may be apply'd to the Engine, sufficient to condense the Air in the Bathing Vessel, as also in the Respiring Vessel to any Degree of Density requir'd; and to know the State of the Air in the Bathing Vessel, as also in the Respiring Vessel, as to the Degrees of Density, Pressure and Heat, there is for that Purpose a mercurial Gage b b, added to each Vessel, with a Thermometer t t, annex'd to the Bathing Vessel, and the like Instrument may be annex'd to the Respiring Vessel also, and likewise there may be added a Hygrometer to both Vessels, the Uses whereof have been shewn before.

20. Now such an Air-Bath or artificial Atmosphere, as I have describ'd in this Chapter, which admits of having its Properties and Qualities of Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, Motion, Effluvia, &c. intended and remitted, regulated and adjusted in all Degrees, Proportions, Alternations and Combinations, and which being apply'd and made to operate upon the whole external Body with all the said Properties and Qualities duly fitted thereto, the same will prove the most perfect, safe, sovereign Remedy and Means both for the Prevention, as well as the Cure of all Diseases, produc'd by the relatively disproportionate Properties and Qualities of the general Atmosphere; for inasmuch as this partial artificial Atmosphere can at all Times, and for any Space of Time, and in all Places, have its Properties and Qualities chang'd and regulated in all Degrees, independently and contrary to those of the general Atmosphere, consequently must prove the most natural perfect Method for Curing all the Diseases produced thereby; so that this artificial Atmosphere with its Properties and Qualities render'd thus changeable at Pleasure, in all Degrees, at all Times, and for any Space of Time, and in all Places, may be consider'd as a true and real, universal, mechanical, fluid Mould, Press or Mill, that may be set wider or closer, tighter or slacker to the Body, or render'd heavier or lighter, hotter or colder, moister or dryer, &c. according as will answer best with the present Case, Indications, and constitutional State of every Individual Person; either to contract or relax the Solids, or to grind, attenuate and assimilate the Texture of the Fluids coarser or finer, &c. so that the Air being by this Method converted into an universal artificial Engine, Press or Mould, the same will thereupon become the most efficacious safe Means and Remedy in Nature, for attaining the two following cardinal primary Intentions, which virtually comprehend the whole Practice of Physick, and all that humane Art can do, either for Preserving Health, or the Cure of Diseases; and that is first, to contract and relax, or raise and lower the moving Force of the Solids, at proper Times, as is found necessary; so as to keep them in a due State and Plight for circulating the Fluids with a proper Velocity. And secondly, in keeping the Fluids of a proper Quantity, and such as is duly proportion'd to the moving Force of the Solids; and likewise of a proper Degree of Fluidity and Tenuity, &c. In the due and regular Effect of which two general Intentions, consists the whole Secret and Art of Health and Long Life; now for Illustration hereof I will produce the following

following Case, suppose then a Person, labouring under a relax'd State of his Solids, which not having Force enough to subdue and circulate the Fluids with a sufficient Momentum and Celerity, their Texture and Temperament will necessarily become vitiated and spoil'd, and acquiring too great Ascidity, Lensor and Viscidity, will lay the Foundation of Diseases of the Chronical Kind; under which Predicament are comprehended all the Valetudinary, Hypochondriac, Hysterical, Cachectic, and those with relax'd Nerves, &c. making in the whole a very numerous Legion and Tribe (especially in an Age of Intemperance and Luxury). Now as this general morbid Constitution (when the same is not hereditary) is the natural Effect of a light, warm, moist Air, to which its other Qualities may contribute very much, and likewise Errors in the other Non-Naturals; now the proper Intentions of Cure in this Case is plain, being always contrary and opposite to the Disease, namely, for to contract, brace, and wind up the Spring of the Solids, and to attenuate and dissolve the Cohesion, Crudity, and glutinous Quality of the Fluids; now the most perfect safe Method to effect both those two curative Indications in the Solids and Fluids; which two Intentions are of all others the oftenest wanted, and the most difficult of all, especially what relates to the Solids, to be thoroughly and perfectly effected; now those two Intentions I propose may be best obtain'd, by submitting the Patient's Body at certain Times to a proper additional Quantity of Pressure, which may be laid thereupon in any Quantity, and for any Space of Time requir'd; and for this Purpose the Person is to be inclosed wholly within a proper Vessel or Machine, (as may be found describ'd in this and the first Chapter) and have the Air condens'd therein, and refrigerated at the same Time, until it operates with such a Degree of Pressure and Cold upon his Body, taking Care also that its other Qualities be so regulated and proportioned, as is most proper for his Case and the Intention here propos'd; by which universal, equable, uniform Pressure, which may be thus apply'd to his Body in all Degrees, and as often, and for as long a Time as is requir'd, the whole solid vascular System, with the contain'd Fluids, will undergo an universal Squeeze, Systole and Contraction, and be render'd more dense, compact and elastick, and relatively stronger, whereupon the original elementary Machinulæ and Fibrilæ of the Solids being brought into closer Union and Contact, and being kept in that State of Approximation for some Time by continuing the Pressure upon the Body, the Attraction of Cohesion will thereupon have Liberty and Time to exert itself, whereby the small Fibrillæ will become mutually and strongly link'd and cemented anew together, and all the Solids become invigorated and have their Elasticity and Motive-Force restored and increas'd, and thereby better fitted to subdue and circulate the Fluids, which at the same Time by this universal Contraction and Compression, communicated to the whole Body by this artificial Atmosphere, will have their Lensor and Viscidity broken and dissolv'd, and by circulating through the whole vascular System, now under a general Contraction, the same will become triturated, and render'd fitter for the several Uses of the animal Œconomy; whilst at the same Time all the Flood-gates of the Vessels that were before clogg'd and barr'd up, will now be thrown open, Obstructions in the Glands remov'd, and all the natural Secretions and vital Motions restored to their proper Standard Measure, &c. And by repeating the Operation of going into this artificial Atmosphere, at proper Intervals, and continuing therein for a reasonable Time, such Person will receive thereby a lasting perfect Cure, with the joint Assistance now and then, of the other new mechanical Methods of applying the Air to the Body, as may be found describ'd in the several following Chapters, observing always a proper Regimen as to Diet, and the other Non-Naturals, which must ever be duly minded let the Means and Methods of Cure be what it will. Now supposing the Person's Case to be the contrary to what it was suppos'd before, and that his Solids are too tense and elastick, in which Case the Fluids being mov'd with too great Celerity, will become heated, rarefied, and alkaline, and thereby dispose the Body to acute inflammatory Distempers; if now this artificial Atmosphere have its Properties and Qualities regulated and adjust'd in a contrary Manner to what they were in the former Case and Intention, by rendering the Air therein comparatively light, warm and moist, the same will serve as effectually for relaxing the too great Rigidity and moving Force of the Solids, as it serv'd to contract and augment the same in the first Case wherein they were suppos'd to be over-relax'd, &c. so that every Time such Person goes into this artificial Atmosphere, his Body becomes really and actually new-fashioned and molded, this artificial Atmosphere serving as a true and real Fluid-Mould and Bandage in respect of his Body, and according to the Degrees of its Density and Pressure, &c. above or below that of the general Atmosphere, so will the Dimensions of his Body every Way, and in every Part, be rendered greater or less proportionally; by which Means we become provided with a much more perfect, safe, universal Method for obtaining those two capital Intentions of contracting and relaxing, or of raising and lowering the motive Force of the Solids, and for regulating the Quantity and Qualities of the Fluids, with the Secretions depending thereon; than from the common Methods now in Practice, by frequent repeated Doses of Emeticks, together with the Cortex, Cold and Hot Baths, and other tedious Courses of Alteratives, Specificks, with Loads of nauseous Medicines, and for most Part quite opposite to the true Intention of Cure; the Effects of all which internal Medicines are not only transient and uncertain, but oftentimes of fatal Consequence; and most commonly, tho' they may remove the present Symptoms, yet lay a Foundation for future Evils much worse than those they were design'd and seem'd to relieve. Now Emeticks in common Practice are fam'd to be the most efficacious Remedies, and to produce the

greatest and quickest Alterations, but then this their Effect is wholly owing to the universal Shock, Contraction and Stimulation which the whole animal System becomes subject to during its Operation, and not to any specifick, occult, transforming Powers or Virtues in the Medicine itself; which same Effect, as has been shewn, may be much more effectually and safely obtain'd by applying a proper Quantity of Pressure to the Body by the Air. Moreover the Operation of Emetics is so violent, that few Persons are willing to undergo the Fatigue and Exercise thereof, and are in many Cases not practicable without great Danger; and besides, the Operation thereof being but of short Duration, its Effects soon wear off, and the Disease returns with fresh Vigour if Recourse be not had to the same violent fatiguing Exercise. And however the aforesaid two general Intentions may be effected by a judicious Application of the Cold and Hot Bath, with other proper Exercise, &c. especially when used according to the new Methods describ'd in the first Chapter; nevertheless there are many Reasons and Cases, which render the effecting of the aforesaid general Intentions by means of the artificial Atmosphere or Air-Bath, properly prepar'd and regulated as before explain'd, as infinitely the best, most efficacious, safe and universal Method, inasmuch as it may be apply'd to all Persons, young or old, strong or weak, at all Times and Seasons, and for any reasonable Time requir'd; whereas the Cold Bath by reason of its too strong and sudden Stimulus becomes improper for the Old, Infirm, and such as have unsound Viscera, internal Tumors, Ulcers, Hemorrhages, &c. And besides, the Exercise of the Cold Bath is too fatiguing and disagreeable to most Persons to pursue the same regularly; all which Inconveniencies will become avoided by having the said Intentions effected by such an artificial Atmosphere; the Air being the natural Element to which the humane Body is ever inseparably related and accustomed from the first to the last of its Existence; neither will a Person in going into this artificial Atmosphere or Air-Bath, be oblig'd to change or take off any of his Cloaths, and thus he may go into the same as often and for as long a Time as his Case requires, or as he finds Benefit thereby, with as little Trouble as in going into his Closet or Study, and the Machine may be so contriv'd as to give him an Opportunity of exercising himself, either in Reading or Writing, or rather with some mechanical Exercise to communicate Motion to his Body, which will be more proper during his Abode within the artificial Atmosphere or Air-Bath. And moreover when this additional Pressure is communicated to the Body by means of Air, the Pressure becomes apply'd to all Parts of the Body equally and uniformly, which can't be done with Water, as being an unelastick incompressible Fluid.

21. Now the true Secret and Art for Preserving and Prolonging Life, consists chiefly in keeping the Solids from Unfolding and Developing too quick, by Contracting, Bracing and Winding up their Springs at proper Times as they want, and in keeping the Fluids of a proper Quantity and Qualities; now the only best Method for attaining both those Intentions, is by applying a proper Quantity of Pressure, &c. to the Body by means of Air, in the Manner before explained: The Truth and Efficacy of which Method we have yet farther confirm'd and establish'd from considering, that the Inhabitants of cold Countries are generally stronger, and longer liv'd, than those of warm hot Countries: Now this Effect is wholly owing to the Difference in the Properties and Qualities of the Air, as to its Gravity, Pressure, Heat, Cold, Humidity, Dryness, &c. Thus in the northerly Regions, the Air being generally denser, heavier, colder, and damper, by its greater Pressure and Stimulation upon the Body, it keeps the Solids from Unfolding too fast, wherein Longævity alone consists; whereas in the southerly Climates the Air being generally rarer, lighter, and hotter; by all which Properties it contributes greatly to accelerate the Growth, Elongation and Expansion of the Solids, whereby all Animals and Vegetables arrive much sooner at their full Growth, and final Dissolution and Death.

22. After being taught by the Observations, Experience and Authorities of so many Ages, that the Air is the principal Cause of animal Life, Health, and Diseases, is it not surprizing, that this great universal Instrument and Remedy of Nature's Appointment, should be so much neglected, and so little regarded, as it is in the present Practice; and that no Attempts have hitherto been made to reduce the same into Use and Practice, for the general Benefit and Health of Mankind, whilst we are industriously ransacking all Nature, and analysing every insignificant Drug, in Search of new Remedies. Thus with what unwearied Study and Application has Mercury been tortur'd and transform'd into all Shapes, in hopes of finding some Catholicon or Panacea, but all in vain and to no Purpose; for let Mercury be transform'd what Way soever, the same, with all other Remedies of the fossil Tribe, will ever remain in its own Nature inimical to, and incompatible with the Structure, Mechanism and Health of animal Bodies; whilst at the same time we have wholly neglected enquiring what Advantages may be produ'd from the mechanical Properties and Qualities of the Air, Nature's great and universal Instrument and Remedy, with the best Methods for obtaining the same; which when properly apply'd, according to the new Methods describ'd in this Treatise, will afford the most perfect Means for Prolonging Life, and the Cure of Diseases.

23. Now the mechanical Effects of the Air upon the humane Body, when thus apply'd thereto by proper Machines, as before describ'd, may be more readily understood, when illustrated by a linear Representation and Draught, such as Fig. 4. Plate 1. already referr'd to; wherein is exhibited the Image, Picture or Section of a humane Body, the external Contour or Surface
whereof

whereof is circumscribed and defined by two parallel concentrick Lines, the outermost whereof is one real continued Line, but the innermost is a prick'd or discontinued Line; which two Lines serve to express and exhibit the different Effects, Alterations and Changes produc'd in the Dimensions of the Body, when submitted to the Operation, Exercise and Discipline of the artificial Atmosphere, already describ'd in this Chapter. Thus, before that a Person enters into this artificial Atmosphere, suppose the real absolute Dimensions of his Body to be defin'd by the outermost parallel compound Line, this Person upon going into this Machine or artificial Atmosphere, and continuing therein for a reasonable Time, and having the Air therein condens'd, and otherwise properly prepar'd (as hath been already explain'd) upon coming out of the Machine, his Body will be reduced to a less Bulk, the absolute real Dimensions whereof may be properly express'd by the innermost parallel prick'd Line. And according as the Air in the Machine is render'd more or less dense, or hath its other Properties and Qualities intended or remitted, so the Dimensions of the Person's Body before, and after his undergoing the Operation and Exercise of this artificial Atmosphere or Air-Bath, will be greater or less proportionally. Thus, suppose a Person in the Morning, or at any other Time of the Day, or Night, when judg'd necessary, submits his Body for a reasonable Time to the mechanical Discipline and Exercise of such an artificial Atmosphere, properly prepared and proportion'd in respect of its Density, Pressure, Heat, Cold, &c. he will find himself thereby greatly refresh'd, invigorated, and much better disposed and prepared to sustain the Exercise of the Day, be what it will, either of the Body, or intellectual Faculties. The Rationale and Mechanism by which all those salutary good Effects become produced being obvious, upon considering that the animal Body upon being thus submitted to a proper additional Pressure, &c. the whole System of the Solids being thereby brought into closer Union and Approximation, the Attraction of Cohesion between the small Machinulæ and Fibrillæ which compose the Solids, will become thereby augmented, and their Elasticity and Spring increased, whereby they will be enabled not only to shake off and dislodge any foreign unassimulable Particles, that may have intruded themselves into their Pores and Interstices, and thereby clogging and impeding their natural Vibrations, but become render'd better able withal to attenuate, circulate, and secrete the respective Fluids, which will likewise become condens'd and reduc'd into less Bulk proportionally, at the same Time.

24. We see then that the several Properties and Qualities of the Air, when judiciously apply'd by proper Machines to the Body, furnishes us with the most efficacious, perfect, universal Means for effecting that primary capital Intention of constringing and relaxing, or raising and lowering the moving Force of the Solids, whereby we may keep the same at all Times regularly and duly wound up like as we do a Clock or Watch. That this Practice must be right and attended with the aforesaid Advantages, requires no other Proof than that of its being perfectly agreeable with the establish'd Order and Method of Nature, the Air being ordain'd and endow'd with the aforesaid variable Properties, on purpose to regulate the animal Solids, by contracting and relaxing, or raising and lowering their moving Force, alternately and successively, as hath been describ'd in the 2d, 3d, 4th, and 5th Articles of this Chapter, &c. For which Reasons such a Machine and Apparatus, (the Charge whereof being withal but inconsiderable) will become the most useful valuable Piece of Furniture for all Noblemen's and Gentlemen's Houses, and likewise for all Hospitals, Infirmarys, and other publick Places, where People resort for Health, &c.

25. The Machine and Apparatus describ'd in this Chapter, will serve equally for bathing either with cold or hot Water, and for performing and procuring all the Operations with the Benefit and Advantages ensuing therefrom, as explain'd in the first Chapter; and with some further small Additions, will serve likewise for performing all the new mechanical Operations and Exercises, and attaining all the salutary Uses and Advantages accruing from thence, as describ'd in the third Chapter, &c.

C H A P III.

General Observations upon the mechanical Effects produced in the Blood, by its becoming subject constantly to the joint Action and Mechanism of the Lungs and Air, wherein the principal Use of Respiration is briefly consider'd; together with another new and important Office assign'd thereto. Wherein also is describ'd the Construction, Application and Use of an artificial Atmosphere, whereby the Air may be made to operate upon the Lungs, with its Properties and Qualities so chang'd, proportion'd and adjusted, as shall suit best with the constitutional State of the respiring Organs in every individual Person, whereby all such Diseases as owe their Original to a faulty, imperfect Respiration and Sanguification, (which is the true productive Cause of most Diseases) may be safely and certainly cured, &c.

1. **T**HE Air being the universal Instrument and Principle upon which the Generation, Growth and Corruption of all Animal and Vegetable Bodies absolutely depend, to answer which great Ends, the same is endow'd with all the mechanical Properties and Qualities requisite thereto; as Fluidity, Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, Attraction, Stimulation, Motion, &c. by virtue whereof it is capable of producing the greatest Alterations in Animal Bodies. Now there are two principal Ways whereby Providence applies this most active universal Fluid for bringing about the several progressive States, Periods and Revolutions of Animal and Vegetable Life.

2. The first notable Operation of the Air, is that which it exerts upon the whole external Body, with respect to which it may be considered as a variable elastick Mould, or universal Fluid Bandage, by the changeable Properties and Qualities whereof the Bodies of Animals are kept in a continual fluxionary State of Exercise, Motion and Rest; and the Ballance of Life kept always librating between Health and Sickness. As has been more fully demonstrated in the Introduction, and likewise in the preceding Chapter, &c. wherein also has been describ'd the Construction of an artificial Atmosphere, whereby all the Inconveniencies and malignant Impressions arising from the Influence of the Air considered as operating upon the whole external Body, may be prevented and remedied, &c.

3. The second important Operation of the Air, is that upon the Blood in the Lungs of born Animals, and this is the principal Scene wherein the good and bad Effects of the Air are most eminently manifested and display'd, as having the whole circulating Mass of Blood constantly and successively brought thither and submitted to the joint Operation and Mechanism of the Lungs and Air. So that as the Air, when its Properties are duly proportioned to the constitutional Structure of the respiring Organs, becomes the principal Instrument of animal Life and Health; so on the contrary, when the same Properties of the Air become, from what Cause soever, relatively disproportionate to the organical Structure of the Lungs, it becomes the most general productive Cause of all the capital Diseases incident to Animal Bodies. These Considerations furnish'd me with an Opportunity to think of a Method how an artificial Atmosphere may be constructed, whereby the Properties and Qualities of the Air may be intended or remitted in all Degrees, Proportions, Alternations and Combinations, so as to suit exactly with the constitutional State of the Lungs in every individual Person.

4. The Solution of this most noble Problem I propose for the Subject of this Chapter, having first previously suggested some occasional Observations that occur'd to me in thinking of this Subject, relating to the Nature and Use of Respiration, with the mechanical Effects produc'd in the animal Fluids by the joint Action of the Lungs and Air; wherein I shall describe the two principal Ends and Uses of this compound Organ, the latter of which Uses being wholly new, is only propos'd as highly probable, and as a proper Subject for future Enquiry. And next propose some new mechanical Methods for constructing this artificial Atmosphere to be apply'd to the Lungs, in like Manner as that describ'd in the second Chapter, is apply'd to the whole external Body.

5. Notwithstanding all the modern Discoveries and Improvements in Anatomy, experimental Natural Philosophy, Mechanics, Hydraulicks, Pneumatics, supported by Mathematicks, our Knowledge of the Animal Œconomy, and Laws by which the Microcosm is govern'd is still very imperfect, and from an unaccountable Vanity and Infatuation we appear to have attain'd to a much greater Certainty, and better Acquaintance with the Laws and Ordnances by which the Microcosm or solar System is regulated. I am however far from thinking the Contemplation of any Province of Nature, and particularly Astronomy, as not highly deserving our Attention and Study, all that I intend hereby is, that the Knowledge of our own Being (according to the old oracular Injunction, *Nosce te ipsum*) ought to claim a Preference to any other, as being a Subject still very far from being exhausted, and abounding with a much greater Variety of useful curious Enquiries, and such as require the deepest Researches and utmost Efforts of the humane Understanding of any other whatsoever. And thus we find that most of the capital Operations of the

Animal

Animal Machine are as yet but imperfectly known, as appears from the different Opinions of Authors thereupon; so that neither the Operation of Animal Digestion, Chylefication, Sanguification, Secretion, Nutrition, muscular Motion, with the true Laws of the Circulation of the Fluids, nor the Uses of the Air in Respiration; are yet truly and certainly known.

6 The Doctrine and Theory of Respiration not being yet fully determin'd, notwithstanding the many labour'd Systems and Hypotheses that have been advanc'd thereupon, Authors being still greatly divided in their Opinions, and the Dispute not yet certainly decided; this being the present State of the Case, I take it for granted, that no Person ought to be deterr'd from offering his Sentiments thereupon, either from a Consciousness of his own Inabilities, or the Unsuccessfulness of those who have gone before; being taught both from Scripture Authority, as well as by Experience and Observation, That the Battle is not always to the Strong, nor the Race to the Swift, &c. To which I think it may be farther added, that the most useful Inventions (by which I mean such as are of real, practical, general Use) do not always fall to the Lot of Persons of the most extensive speculative Knowledge, but more frequently to Persons of greater Practice and Experience, tho' with comparatively less enlarg'd intellectual Faculties. And should what is offer'd as new upon this doubtful Subject, amount no farther than to a Degree of Probability and Verisemblance, it is but reasonable to hope the same will not be condemn'd, before being duly weigh'd in the just Ballance of Reason and Experience, and found to bear the Mark and Criterion either of Truth or Error.

7. But to return from this Digression to the Subject in hand; with respect then to the Operation and Use of the Air in Respiration, with its Effects upon the animal Fluids in the Lungs, which being an Organ of a very compound Structure and Operation, some of the subordinate secondary Uses whereof are well known as being self-evident, such as its being instrumental in forming the Speech, and ministring to the Action of Suction, as also to the Sense of Smelling, by conveying and applying the odorous Effluvia to the olfactory Nerves: But as to the primary Use of the Air, whereby it becomes so absolutely necessary to the Life, and Growth of Born Animals, this important Article is still but imperfectly known, the true and perfect Knowledge whereof would be of infinite Use to discover both the original Cause, and Seat of Diseases, with the most perfect Methods of Curing them. For as the Stomach and Lungs are the two principal Organs of Force in the animal Machine, for subduing and preparing the Fluids for their respective Offices, so that most Diseases take their first Original and Growth from a Defect in one, or both the said two Organs, so that was the true Mechanism and Operation thereof once fully known, with their Diseases or Disorders, and whether the Defect be in both, or only one of the said Organs, with the Time when they first happen, and by what Cause the same was produced, this would lay a solid Foundation for a more perfect and successful Practice in the Cure of most Diseases.

8. In order then to discover the true End and Use of the alternate Systole and Diastole of the Lungs in Respiration, it will be necessary to observe the several Stages, Periods and Progress of the animal Fluids, from their first Change and Preparation in the Stomach, until they arrive at the right Auricle and Ventricle of the Heart, and to consider what further Alterations the same must and ought necessarily to undergo, before it is sent to the left Ventricle, in order to be detach'd to the several Parts of the Body for the Offices of Circulation, Sanguification, Secretion, Nutrition, muscular Motion, &c. In the first Place then, the Animal Machine consisting of two general Principles, the Solids and Fluids; now the Solids by their continual Motion, Friction, Attrition, and from the Reaction of the circulating Fluids, do necessarily suffer a constant Waste and Expence, and require as constant a Supply and Repair, which is wholly furnished from the Fluids: The Fluids also, by what is thus supply'd for the Nutrition of the Solids, become also under a like Necessity with the Solids of receiving a continual Supply of fresh Matter, which Supply is furnished from the Aliment, which being first duly mix'd with the Saliva, and other proper Liquors in the Stomach, is by its muscular Action, assisted by the alternate Systole and Diastole of the Diaphragm, and abdominal Muscles, together with the expansive Force of the inclosed Air, triturated, dissolv'd and analiz'd; and being from thence protruded into the intestinal Tube, where mixing with the Bile and pancreatick Juices, has its Texture farther broken, elaborated and exalted, and being by the peristaltick Motion of the Intestines, together with the included Air, objected and presented to the Orifices of the lacteal Vessels, becomes absorb'd and attracted into the same, through which capillary Tubes it is further propell'd, and being collected into one common Receptacle, is from thence transmitted, together with the Lympha, wherewith it is here plentifully supply'd to dilute the same, through the thoracik Duct to the right Ventricle of the Heart, to be there mix'd with the Blood returning from all Parts of the Body by the Vena Cava; now as the Blood returning from all Parts of the Body is render'd vapid, viscid and effete, having lost most of its balsamick, nutritive Parts, which have been apply'd towards the Nutrition and Repair of the Solids, and as the Blood must also become more viscid, gross and cohesive in circulating through the Veins with the diverging System of the Arteries, together with what it has lost by the several glandular Secretions; upon all which Accounts the reflux Blood must have its Texture decomposed, and require to be anew repair'd, attenuated and analiz'd, and likewise to be supply'd and mix'd with a Quantity of fresh

new Matter or Chyle, before it is fit to be sent out again to carry fresh Nutrition to the Parts, and to continue the Circulation; and for this End it is made for to circulate and return successively to the Heart, to be thus cohobated and mix'd with the fresh Chyle constantly flowing in there out of the thoracic Duct; now as the Blood requires to have its compounding Principles intimately mix'd and blended with the Chyle before it is fit to convey proper Nourishment to the Solids, this Mixture and Cohobation is first of all but very imperfectly perform'd in the right Auricle, and then in the right Ventricle of the Heart; but as this Mixture of the Blood with the Chyle can never be sufficiently and perfectly effected by the Force and muscular Action of one single large Vessel or concave Muscle, as that of the right Auricle and Ventricle of the Heart, in order then to answer this important End and Intention, there was an absolute Necessity for having the animal Machine furnish'd with another more appropriate Organ peculiarly fitted for to answer that Purpose, such as are the Lungs, which by virtue of their special Mechanism and Structure are in all Respects most perfectly fitted for performing this most essential Office. This therefore appears to be the final End and principal Design of this most admirable Organ, which from its Organization and Use may be call'd a perfect pneumatick Engine, and serves like to a Mill or Press for to grind, attenuate, intimately mix and assimilate the Principles of the Blood, with those of the Chyle together, so as to form one smooth, balsamick, nutritive Fluid of a similar, homogeneous, uniform Texture in all its Parts, in such wise that the Particles of the Blood, Chyle and Lympha shall be every where perfectly compounded together, whereby the same becomes endow'd with all the necessary Qualities of a Fluid most perfectly mix'd, compounded and assimilated, and thereby fitted for supplying Nourishment to all Parts of the Body equally and alike; this therefore I take to be the first principal obvious End and Use of Respiration, or of the joint Operation of the Lungs and Air; and in consequence hereof it may be observ'd, that whensoever Respiration is not duly perform'd, neither the Offices of Sanguification, Circulation, Secretion, Nutrition, &c. upon which the Health of the animal Machine wholly depends, can ever be well executed. So that to this one Cause alone of a defective imperfect Respiration, join'd to the Disorders and Defects of the Stomach (as describ'd in the seventh Chapter) most if not all Diseases may be referr'd as their proper original Source and Seat. For supposing a Person to have the System of his Solids and Fluids originally sound and well constituted, such a Person can only become diseas'd from what he takes by way of Aliment, by its being disproportionate either in Quantity or Quality, or both, to the digestive Power of the Stomach and the other Glands and Viscera, which we may call the Errors or Diseases of Digestion; or the same individual Person may become subject to Diseases of all Kinds, from the mechanical Effects of the Air, consider'd as operating with a Momentum and Force relatively disproportionate either to the constitutional State of his whole Body, but chiefly and principally of his respiring Organs; for if the Properties and Qualities of the Air be not duly proportion'd relatively to the organical Structure of this Person's respiring Organs, the Consequence will be an imperfect Respiration, whereby the Blood not having its compounding Principles duly assimilated and mix'd, the Work of Circulation, Sanguification, Secretion, Nutrition, &c. depending thereupon, cannot be duly perform'd; from whence, as from another fruitful Source and Original, Diseases of all Sorts may be produc'd. That a defective Respiration is of itself alone a Cause sufficient to produce all Kinds of Diseases, is a Truth abundantly manifest; for if the respiring Organs, from any Cause whatever, either from their being of too lax, tense, and rigid Structure, or from the State of the Air, being either relatively too heavy, or too light, hot or cold, moist or dry, or impregnated with Effluvia of any Sort, &c. become incapacitated for executing this their principal Office of triturating, dissolving, and intimately mixing the Blood, Chyle, and Serum, &c. together, when the Blood comes to be projected out of the left Ventricle of the Heart into the Aorta, and thence distributed through the diverging System of the Arteries to all Parts of the Body; now the Chyle not being perfectly mixed with the Blood in this Case, the same as being the lightest Fluid and having the least Momentum, will become determined and forced towards the Sides of the Vessels, whilst the Blood being more dense and heavy will keep moving along the Axis of the Vessels, whereby the Chyle which contains the Matter for Nutrition, will be distributed unequally to the several Parts, and being withal crude, viscid and cohesive, for want of a due Commination in the Lungs, the same will become directed unequally to the several Glands, Viscera, &c. producing universal and particular Obstructions, Atrophies, Dropsies, Cachexies, Fevers, with all sorts of Diseases; so that when the constituent Principles of the Blood are not kept duly attenuated and compounded together by the Action of the Lungs and Air, the Fluids must of Course degenerate and verge towards a distemper'd State, becoming either too viscid and crude, or too much rarefied, alcaliz'd and dissolv'd in their Crasis and Temperament; the former acid State being the Original of such Distempers as retain to the chronical Kind, as the latter alkaline State is of the acute Kind, and in proportion as the Fluids become diseas'd, the Solids which derive their Nutrition therefrom, must by Consent participate the same Fate; so that the whole animal System both Solids and Fluids must hereupon become subject to Distempers of all Kinds, which though proceeding from this one general Cause alone of a defective Respiration, yet will appear specifically differenced by various Phenomena, Symptoms and Circumstances, as if they were really produced by different distinct Causes, according as the several

Glands and Viscera are more or less disposed to receive and retain the first Impressions and Attacks of the morbid Fluids.

9. As the Operation and Effects of Respiration extend not only to the Region and Cavity of the Thorax, but likewise to that of the Abdomen, with all the Organs, Viscera and Vessels contain'd therein, it must therefore have some important Use and Effect within the Region of the Abdomen also, as Nature never does any Thing in vain; we observe then that the Cavities of the Thorax and Abdomen are both subject at the same Time to an alternate Systole and Diastole, or Contraction and Dilatation, we have already consider'd what Effects this alternate Motion must produce in the Blood, as it circulates through the Lungs, in which Operation the Air by its alternate Injections and Ejections into and out of the Lungs, in the Acts of Inspiration and Expiration, may be consider'd as a Fluid, Piston, or Pestil acting by successive Strokes upon the Blood in the pulmonary Vessels, which may be conceiv'd as a Mortar or Kneading Trough, wherein the Blood is kept constantly pounded, kneaded and assimilated. Now as the Air within the Cavity of the Abdomen acts after a similar Manner upon the Food in the Stomach, and upon the Chyle, &c. in the chylopoietick Organs, as the Air does upon the Blood in the Lungs, for which Reason we are to consider the Operation of Respiration as one principal Agent and Instrument in the Work of Digestion, or the first Reduction and Preparation of the Aliment in the Stomach, &c. Thus the Air included in the Abdomen, and that in the compound alimentary Tube together with the Food, &c. are as two antagonist Powers serving to counterballance each other, as also the external Air, so that in each Act of Expiration the Air in the Cavity of the Abdomen and alimentary Tube becomes condens'd, by the Contraction and Compression of the Diaphragm and abdominal Muscles, as in every Act of Inspiration the Air becomes rarefied by the Dilatation of the said Cavity; by which alternate Condensation and Rarefaction of the Air in the Cavities of the Thorax and Abdomen, all the Organs, Glands, Viscera and Vessels in both Cavities become subject to a like alternate Systole and Diastole, by which alternate Pulsation thus continually communicated to the Stomach and chylopoietick Organs, the Food is kept in a constant Agitation, and becomes beat, dissolv'd and broken as it were with a Pestle in a Mortar, the Air performing by its alternate Condensation and Rarefaction the Office of a Pestle, and the alimentary Tube, &c. that of a Mortar; the Chyle being likewise by the same Cause impell'd and propagated through the lacteal Vessels and thoracic Duct to the Heart. And thus not only the Stomach and chylopoietick Organs, but all the other Viscera and Glands situated in the Regions both of the Thorax and Abdomen, as the Heart, Liver, Spleen, Kidneys, Urinary Bladder, Womb and its Contents, as also the Trunks of the Aorta, and Vena Cava, and by Consequence the whole vascular System, with the contain'd Fluids, become all subject to the like alternate Systole and Diastole communicated to them all at the same Time by the alternate Condensation and Rarefaction of the Air within the said two Cavities, at every Inspiration and Expiration.

10. Notwithstanding that famous Muscle the Heart, be commonly reputed the principal sole Machine for effecting the Circulation of the Fluids, this Organ, however does no wise appear to be a Power and Cause adequate and sufficient for such an Effect, and for overcoming so great a Resistance; but what Force is wanting in the Heart and Arteries for this Purpose, we shall find abundantly supply'd by the Organs of Respiration, which considering the extensive Operation and Effects thereof, with the great Apparatus of mechanical Powers and Muscles that are employ'd therein, and receive Motion thereby; the same may be very justly named the *Primum Mobile*, principal Spring and moving Force of the Microcosm or animal Machine, and upon which all the other Movements, with the Circulation of the Blood chiefly depends; so that I think we need not scruple ascribing this as another primary Use of the Organs of Respiration, namely, of their serving as a principal Auxiliary Power, together with the Heart, for effecting and continuing the Circulation and Distribution of the Fluids. And from thence we may justly conclude, That the two great catholick Operations of Digestion and Respiration, or Aliment and Air, with Exercise or Motion, are the true general, original Principles whereon animal Life and Health depend, and from the Errors and wrong Use, whereof most, if not all Diseases are produc'd; and by which alone they are to be cured; so that there is no Occasion of multiplying the Catalogue of Diseases *in infinitum*, and endeavouring to account for their Production, by a like infinite Chain of unintelligible, remote Causes, according to the modern Practice, to the great Confusion of Physick; when it is demonstratively evident, that all the original, distinct, morbid Constitutions and Diseases, may be, and really are, produc'd from the obvious, self-evident, mechanical Effects of Digestion, and Respiration, or Aliment, Air, with Exercise or Motion.

11. That the End and Use of Respiration is not as many Authors maintain, for to supply the Blood with fresh Air, is, I think, pretty manifest, the Blood rather appearing to want some of the Air, wherewith it is always more or less replete and absorb'd, rather drawn off and discharg'd out of it, than to have more added to it. As I shall shew in the Sequel; and as to the Case of Animals dying in Vacuo, or in an exhausted Receiver; as also when made to breathe the same individual Air, this does not appear to be from a Want of Air, or any nitrous Particles, not being transmitted and convey'd to the Blood, but from the Circulation becoming in both Cases entirely stopp'd in the Lungs, by the great Resistance and Compression upon the Blood Vessels of the Lungs, which become collaps'd and contracted in the first Case; and in the second

Case

Case so greatly expanded by the internal Air in the Blood (now becoming greatly rarefied and heated, the external Air not permitting it now to exhale fast enough) and being strongly compress'd outwardly by the external Air becoming now also greatly heated and rarefied, by being absorb'd with the Steam and Vapours issuing from the Animals, Body and Lungs, so as to arrest and put an entire Stop to the Circulation of the Blood through the pulmonary Vessels, whereupon the Death of the Animal must necessarily ensue in both Cases.

12. Now with respect to the Use that has been assign'd to the compound Operations of the Lungs and Air, as Experiments in Matters of this Nature, carry a much stronger Conviction and Evidence than bare Arguments, and abstract Reasoning alone, for this End the following Experiment is proposed, which if practicable, will serve as an Experimentum Crucis, both to establish and confirm what I have already advanced, with what I have farther to add as to the Uses of Respiration, which is this, suppose the Pulmonary Artery of any adult healthy Animal, could be brought to communicate with the pulmonick Vein, by an anomalous Canal or Isthmus, like to what is observed in the Fœtus, so that all the Blood was made to flow directly out of the Artery into the Vein, without suffering any to pass through the Ramifications of the said two Vessels within the Cellular Substance of the Lungs, by causing the Pulmonary Artery and Vein, as suppose of a Dog, to communicate by means of an artificial Pipe inserted between both. Now I will suppose this Experiment to be actually made, whereupon I will venture to advance the following Positions. First, That the Animal if it is not kill'd under the Operation, will continue to live, and the Circulation with the other vital Functions and Motions be carry'd on as before, this being suppos'd to be true in Fact, the following controverted Points will be clearly made out, namely, that Respiration or the alternate Dilatation and Contraction of the Lungs, is not intended for conveying fresh Supplies of Air, or Nitre, or both, to the Animal Fluids in order to preserve Life, forasmuch as this Animal is supposed to live, and to have all the vital Motions and Actions perform'd, altho' totally depriv'd from receiving any fresh Supplies either of Air, or nitro-aerial Particles, by the Lungs, as having in this Case none of the Blood circulating therein. Secondly, supposing the Animal to survive the Operation, yet it must necessarily, and that in a short Time, become arrested with great and mortal Distempers, for as the Blood of this Animal having its natural Course through the Lungs interrupted, and being now made to circulate only through the Heart, with the Ramifications of the Aorta and Vena Cava, the constituent Principles thereof must be very imperfectly attenuated, compounded and assimilated, by the muscular contractile Force of the Heart, and that of the arterial and venal Systems, for want of the joint and principal Operation of the Lungs and Air thereupon; whereby the Crasis, Texture, and Temperament of this Animal's Blood becoming entirely dissolved and compounded, the same will be render'd soon unfit for the Offices of Circulation, Secretion, Nutrition, &c. and thereupon become dispos'd to coalesce and form large Moleculæ, producing universal and particular Obstructions, Tumors, Ulcers, Cancers, Inflammations, Atrophies, Dropsies, Pollipusses, Fevers, &c. so that this Animal must of Necessity, and that within a short Time become affected with most or all the said Diseases, and die; now as the Death of this Animal is purely owing and produced from the Blood's not having its compounding Principles duly attenuated and combin'd together, for want of the joint Operation and mechanical Effects of the Lungs and Air thereupon, this will serve plainly to demonstrate, that the principal End and Use of this most wonderful Organ is intended principally for the Purpose aforesaid, for grinding, attenuating and intimately combining the constituent Principles of the Blood together. And the Reason of the Fœtus living without the actual Use and Exercise of its own Lungs, is, that during the Time of Gestation, the Fœtus being to be consider'd as a temporary Appendage ingrafted on to the Mother's Body, and being supply'd and nourish'd with her Blood, which being constantly sent to, and return'd from the Fœtus, like as it is to and from the Parts of her own Body, in order to be anew attenuated, repaired and manufactured by the Mother's Lungs.

13. Having shewn the first obvious principal Use of Respiration to consist in dissolving, attenuating and combining the Principles of the Blood together, the Texture, Crasis and Temperament whereof becoming spoil'd each Time, it circulates through the diverging and converging Systems of the Arteries and Veins, requires to be anew compounded and repaired, by undergoing the mechanical Operation and Effects of the Air, by Means of the Pneumatick Engine or Mill, the Lungs. Having also shewn a second obvious principal Use of Respiration, to consist in its serving as a joint auxiliary Power and Force to assist the Stomach and chylopoietick Organs in the Analysis and Preparation of the Aliment, &c. a third principal Use is its being a Power jointly with the Heart for continuing the Circulation of the Fluids. I come now in the next Place to offer what appears to me to be another new principal Use of that complex Organ the Lungs, having first premis'd the following Remarks and Observations.

14. First, The animal Fluids are formed, and consist chiefly of elementary Water, in which the Particles of the solid Aliment are dissolv'd and absorb'd, which after having undergone various Digestions and Solutions, first in the great concoctive Gland, the Stomach, and being afterwards sufficiently subdued, attenuated and analiz'd, chiefly by the Action of the Air and Lungs, and by circulating through the vascular and glandular System, forms and constitutes that complex Fluid the Blood.

15. Secondly,

15. Secondly, besides the foresaid two Principles of elementary Water, and Earth or solid Aliment, concurring to the Formation of the Blood, there is likewise a certain Quantity of elementary Air requisite to maintain and keep up a proper Degree of Rarefaction, Tenuity, Oscillation, and Heat in the animal Fluids, and also to preserve a due Ballance and Counterpoise with the external Air or Atmosphere.

16. Thirdly, There is also a certain Proportion of elementary Fire or Heat requisite thereto, which being as an universal Menstruum and Ferment in respect of terrestrial Bodies, the same serves to maintain and keep the Animal and all other Fluids in a proper Degree of Heat, Tenuity, Oscillation, and Fluxility, without the continual Presence and Action whereof, jointly with the Air, the same would be reduced to a State of absolute Rest and Solidity.

17. Fourthly, the four elementary Principles aforesaid, being mutually and harmoniously allied and combined together in just Quantities and Proportions, the animal Fluids may be then said to be healthy and well constituted, but when the natural Vinculum and Union becomes broken, and the Equilibrium chang'd between the said Principles, by any one of them becoming either deficient or redundant, in that Case the Fluids will at the same Time begin to verge towards a distemper'd State.

18. Fifthly, Water as well as all the animal Fluids, may be conceiv'd to serve as a Menstruum in respect of Air, and reciprocally Air, may be conceiv'd as a Menstruum in respect of Water, and all the animal Fluids; there being always a certain Quantity of Air lodged and arrested within the Pores and Interstices of Water, and all the animal Fluids, under all the Changes which they undergo in the Course of the Circulation and during the Life of the Animal.

19. Sixthly, The oftner and longer the Fluids circulate through the vascular System, they become more attenuated, heated, rarefied and alkaline, by which means the imprison'd absorb'd Air, (as the Particles of the Blood become more analiz'd and rarefied, the Attraction of Cohesion among the Particles will be render'd weaker, by their being set at a greater Distance from each other) being now at greater Liberty, and becoming more heated and rarefied withal, must have its Elasticity thereby increased, and by evolving its Spring must produce too great a Rarefaction in the Blood; in which Case this very Air that before was so absolutely necessary for dissolving the Texture of the Aliment, and render it commiscible with the animal Fluids, and for maintaining them in a proper State of Tenuity, Heat and Fluxility; by having its Elasticity thus increas'd by the Attrition, Heat and frequent Circulation of the Fluids, becomes in this Case, and in this rarefied State and Quantity, really prejudicial and noxious, and must become quickly fatal to the animal Machine, by putting an entire Stop to the Circulation of the Fluids, being now replete with such a Quantity of rarefied hot Air, occasioning an universal Expansion, Compression and Resistance to the circulating Blood, throughout the whole Series of the Vessels, Viscera and Glands. This heated rarefied Air, as the same becomes thus too much accumulated, must therefore have some proper Emunctory or Spiracle for discharging the same out of the Fluids, in like Manner, and for the same Reason, as all the other Parts and Principles seperated from the Blood have, when of no farther use to the animal Œconomy; for discharging the Blood of which useless noxious Parts, the animal Machine is every where furnished with appropriated Glands for that Purpose, serving as Drains or Sewers for carrying off all such Parts from the Blood, the further Retention whereof would be prejudicial; and thus the renal Glands serve to draw off the saline Particles, absorb'd and diluted with a considerable Quantity of the aqueous Part; and in like manner the cutaneous Glands serve to discharge the sulphureous volatile Alkaline Particles, and such as have undergone the utmost Degrees of Tenuity, Digestion and Exaltation out of the Blood, &c. And thus we see the absolute Necessity of having the animal Machine provided with such glandular Strainers for discharging the superfluous excrementitious Parts out of the Blood, in order to continue and perpetuate its vital Motions.

20. Allowing the foregoing Reasoning to be true, namely, That the Air that is arrested, absorb'd and dissolv'd within the Pores of the animal Fluids, will, by the frequent Circulations, with the Attrition and Heat consequent thereupon, become more and more rarefied, whereby acquiring a greater expansive centrifugal Force, it will throw open its Prison, and enlarge its Bounds, and cause the Fluids to rarefy and expand; whereupon the Blood requiring more room to move in, must greatly distend the whole vascular and glandular Systems, and by laying too great a Pressure and Resistance thereon, more than what the Elasticity and moving Force of the Solids are able to subdue and overcome, will endanger the putting an entire Stop to the Circulation, if this rarefied Air and windy Flatus is not quickly and duly discharged in proper Quantities out of the Blood. It follows therefore by necessary Consequence, that the animal Machine must be, and actually is furnished with some proper Organ, Gland or Spiracle, for secreting and discharging this rarefied heated Air out of the Fluids, as the same becomes too much accumulated therein: This being granted for true, the next Point is to determine which appears to be the most natural, simple, plain and obvious Drain and Emunctory, and what Mechanism and Apparatus is most proper to constitute an Organ or Gland for seperating this noxious windy Halitus and rarefied Air, and detaching the same out of the animal Fluids, in proper Quantities, and as it becomes necessary.

21. Now the Air which is thus intimately imbib'd and absorb'd in all the animal Fluids throughout all the Stages of its Circulation, can never be carry'd off, or secreted from the Blood purely and by itself alone, under the Form of perfect elementary Air; for in such case it must be supposed to be first amass'd and collected into a Body, so as to form separate Air-bubbles within the Vessels; which Case can never happen in a natural State, without being attended with the most fatal Symptoms, and bringing on immediate Death. This Air therefore must always be understood to be separated and carry'd out of the Blood, not purely *per se*, but as being absorb'd, wrap'd up and envelop'd with an aqueous Vapour or Halitus, as its proper Menstruum and Vehicle, and under Favour and Cover whereof it becomes fitted for making its Escape through the Membranes of the Lungs. For it is to be observed, that Air when thus absorb'd and dissolv'd within an aqueous Menstruum and Vehicle, will pass therewith through the animal Membranes, which pure Air by itself alone could not do. And thus we find the like Necessity of an aqueous Menstruum, for separating and discharging the animal Salts out of the Blood, which Salts could never be secreted or drawn off purely and simply by themselves, by any animal Mechanism, or Glandular Structure whatsoever, without being first well diluted, dissolv'd, sheath'd and absorb'd in an aqueous Menstruum.

22. Moreover the greatest Part of the animal Fluids consisting of Water, there is but one Organ in the Body, whose Office has hitherto been reputed to serve chiefly for separating the aqueous Part in any sensible Quantity, and that is the Kidneys, which serve to secrete the Saline Particles, dissolv'd in a considerable Quantity of the aqueous Part; the renal Glands however do not appear sufficient and adequate for separating all that is necessary of the watery Part of the Blood, and besides, there is no other Organ or Place whereat the Remainder can be so conveniently separated and discharg'd as by the Lungs, which are constructed with all the necessary Apparatus and Properties requisite for that Purpose.

23. Now in Relation to this last new principal Use of Respiration, I humbly propose it as my Opinion and Conjecture only, not being able for want of proper Experiments, Facts and Observations, to carry this Point to any higher Degree of Evidence and Proof, than that of the greatest Probability and Verisemblance; namely, That the Lungs, besides the first principal Office assign'd them before, of grinding, attenuating, and keeping the compounding Principles of the Blood perfectly mix'd, blended and assimilated equally together, have moreover this other important principal Use and Office of separating and discharging the Air, or at least such a Part thereof out of the animal Fluids, the farther Retention whereof would be prejudicial, by being too much rarefied and heated in the Course of Circulation. The Lungs therefore I conceive to be a perfect Gland and Organ, peculiarly fitted by Virtue of its Organization and Mechanism, by which the Air in the animal Fluids, as the same comes to be too much accumulated, rarefied and heated, and thereby render'd noxious and incompatible with Animal Health, is secreted and discharged thereout, being absorb'd and envelop'd with an aqueous Vapour, in order to refrigerate and condense the Blood, and give it room to subside and circulate with more Freedom, and less Resistance within the several Series of Vessels; as becoming hereby more dense, and taking up less Space, by having the redundant rarefied Air extracted and detach'd out thereof. And for this End the Lungs appear to be constructed with a peculiar Apparatus, and with all the requisite Properties that concur to the Composition of the other Glands, and that in a much more eminent Degree, whereby they become fitted in a special Manner for performing this new and most important Office here assign'd to them. Now for to answer this great End, we find the whole System of the circulating Fluids is made for to move constantly and successively through this Organ, being brought thereto by the pulmonary Artery, and carried off therefrom, after it has had the superfluous rarefied Air extracted thereout, by the pulmonary Vein; this Organ being likewise furnished with Nerves like as the other Glands, and the Aspera Arteria or Trachea, may be conceiv'd as its excretory Duct, through which this heated rarefied Air is continually reaking and breathing under the visible Form of an aqueous Vapour or Halitus, the external Air or Atmosphere serving as a proper exhaling Medium for to convey the same out of the Lungs, in like Manner as the Smoke is discharg'd through the Funnel of a Chimney, in order to ventilate and preserve the Life of Fire, without which the same would become quickly oppress'd, suffocated and extinguish'd.

24. Some Authors maintain, that the principal Use of Respiration, is for to serve as a Refrigeratory for to cool the Blood as it circulates through the Lungs: This, tho' not the principal End, may well enough be admitted as one of the secondary subordinate Uses and Designs of this very complicated Organ. This Opinion however is not the same with that which I propose and intend to establish here; for according to the Opinion of those Authors, the Blood becomes cool'd only by the Application of the cold external Air to the Vesicles and Blood Vessels of the Lungs; whereas what I here mean and intend, is, that the Blood becomes cool'd, condens'd and ventilated, not only by the Application of the external Air to the Blood Vessels expanded throughout the whole vesicular Area of the Lungs, but chiefly and principally by having a certain Quantity of the internal elementary Air separated and discharg'd out of the Fluids, by the Glands and Pores of the Lungs, together with a proper Quantity of the aqueous Part of the Blood, as may serve to absorb and envelope the same, and under Cover whereof it procures a Passage and

Escape

Escape through the membranous Substance of the Lungs, and becomes exhaled into the external Air or Atmosphere in every Act of Expiration; just in like Manner as the saline Particles are secreted by the renal Glands, by the Mediation and Favour of the same aqueous Fluid, which serves as a common Menstruum to dissolve and sheath the same, and thereby fit them for passing the renal Glands, without obstructing, lacerating and stimulating them.

25. Moreover the Lungs being so wonderfully framed, that their internal Area, when fully inflated, is of equal or rather greater Extent than the whole external Surface of the Body, and as the whole Mass of Blood is made for to circulate through the pulmonary Vessels, infinitely divaricated through so large a Surface; the Blood in circulating through the Ramifications of the pulmonary Artery, being to be understood as moving through a System of diverging Vessels, the Point of Divergence being at the right Ventricle of the Heart, or where the pulmonary Artery enters undivided into the Lungs, but the Blood in circulating through the Branches of the pulmonary Vein, moves in a System of Vessels converging towards the left Auricle of the Heart, or where all the Branches of the pulmonary Vein become collected into one large Trunk. All which Circumstances and Disposition appears strongly to corroborate and favour the Design of letting the Air in the Blood, as the same becomes too much rarefied and heated, have an Opportunity of making its Escape thro' the Pores and exhaling Vessels of the Lungs; which Separation of the aerial, combin'd with the aqueous Particles of the Blood, could not have been executed by any other Organ, not even the cutaneous Glands, which have been hitherto reputed as the only proper Organ for performing this Office; being firmly of Opinion, that the cutaneous Glands in their natural healthful State, are chiefly and only design'd for secreting and discharging the sulphureous, volatile, oleaginous, alkaline Particles, and such as have undergone the ultimate Analysis, and highest Degree of Exaltation and animal Digestion: And besides, as has been before remark'd, was the aqueous Parts of the Blood, with the Air absorb'd therein, suffer'd to exhale and transpire constantly through the Glands of the Cutis, the Extremities of the Nerves ministering to Sensation and Feeling, which are plentifully diffus'd over the whole external Body underneath the Cutis, would become so soaked and relaxed thereby, as to be render'd incapable of receiving and communicating those quick undulatory Vibrations and tonick Motions, necessary for conveying the distinct Impressions and Ideas of sensible Objects to the common Sensorium. And moreover the Membrana adiposa, which is expanded over the whole Body under the Cutis, appears to be appointed designedly to serve as a Defence and warm Covering to secure the Nerves from receiving Damage and Injury this Way, by cutting off all Communication, whereby no such aqueous Particles are permitted to pass either out of the Body, or into the same, by way of the Cutis; for as this cellular Membrane is plentifully fill'd with animal Oil and Fat, the Particles whereof attracting each other more strongly than they do those of Water, for which reason they are endow'd with a repelling Force in respect to the Particles of Water, and consequently in a natural healthful State will never admit of any aqueous Particles to pass either out, or into the Body, by any exhaling or inhaling Vessels in the Cutis. And moreover the internal Membranes and Vesicles of the Lungs being always kept warm and moist, by a Quantity of warm Air and Vapours that is left remaining in the Lungs after every Expiration, the Pores and perspiring Vessels thereof are kept ever supple, open, and in a proper exhaling Condition, for the rarefied aqueous Particles, with the heated noxious Air absorb'd therein, for to breathe and transpire out thereat; where being receiv'd into the denser, cold, external Air, the same serves as a proper exhaling Medium for carrying the same out of the Lungs at every Expiration. Moreover as the internal Area of the Lungs is of greater Extent than the whole external Cutis of the Body, and as the internal Membrane of the Lungs is always kept warm and moist, and in a fit perspiring State and Disposition, and as the whole sanguinary Mass is made to circulate successively through the pulmonary Vessels, infinitely rarefied and divaricated throughout the membranous Substance of the Lungs; upon all which Accounts the Lungs appears to be design'd and much better fitted for making a larger Discharge from the Blood than the cutaneous Glands, and that especially in the more northerly cold Climates, where the Pores and exhaling Vessels of the Cutis are more obstructed by the greater Density, Cold and Humidity of the Atmosphere, than what it is in the more Southerly warm Countries. From which Considerations I am farther inclined to think, that the Quantity of Matter that has hitherto been ascrib'd and plac'd to the Account of insensible Perspiration, by the cutaneous Glands, is not really near so much (especially in cold Countries) as has hitherto been commonly computed, and that the far greater Part of that Matter ought rather to be charg'd and assign'd to the Lungs, as being continually and very sensibly transpiring from its whole internal membranous Substance; the Lungs being an Organ in all Respects much better fitted for making rather larger Secretions than what the cutaneous Glands are.

26. Moreover some Experiments that have been made with a View to clear up the Theory and Doctrine of Respiration, appears strongly to corroborate the Truth of what has been here advanc'd upon this Subject, namely, that the second principal Use of the Lungs is for to serve as a special Gland and Organ, by which the Air, that is intimately absorb'd within all the animal Fluids, when the same becomes unduly heated and rarefied by the frequent Circulations and Attrition of the Fluids, is secreted and discharg'd out of the same, together with the rarefied aqueous Particles

and

and Vapours which serve as a proper Medium for conveying the same through the exhaling Vessels of the Lungs. And thus it has been found upon Experiment, that Air cannot be injected by the Trachea or Aspera Arteria, neither into the pulmonary Artery nor Vein; and that Water, wherein there is always a Quantity of Air absorb'd, being injected into the Pulmonary Artery, pass'd into the Trachea, which Air alone also did; but Water being injected into the pulmonick Vein, being push'd with great Force, pass'd with much Difficulty at last into the Trachea.

27. It has been already observ'd, that when the great concoctive Gland, the Stomach and chylopoietick Organs are in a fit Condition for performing their first Office of dissolving and preparing the Aliment, in the Performance of which compound Operation, the respiring Organs, as also the Diaphragm and abdominal Muscles, by reason of their alternate Compression or Systole and Diastole, are to be consider'd as principal auxiliary Powers. And when the respiring Organs are in a Condition to execute duly their next subsequent Office of farther triturating, dissolving and mixing the Blood and Chyle together, that supposing the other Viscera and Glands sound, such a Person will enjoy all the Advantages of a perfect Sanguification, Nutrition, Secretion, with all that is necessary to perfect Health. But whenever any of the said two Organs are deficient, then the Fluids will become corrupt and diseas'd, and gradually communicate the like Disorders to the Solids. Now as the joint Action of the Lungs and Air upon the Blood, has so essential and necessary a Connection with the Life of Animals, that they can't live one Minute without, from whence it is manifest what great Changes may be produced thereby both as to the Production, and the Cure of Diseases.

28. With respect then to the first principal Use of Respiration, let us suppose a Person to have the System of his Solids and Fluids perfectly sound and healthful, yet if his respiring Organs be not rightly constituted, being either of too relax'd and weak, or too tense and elastick a Structure; or be any how obstructed or contracted; or even supposing his Lungs to have all the Advantages of a perfect Structure, yet if the Air be either too heavy, or too light; too dense or rare, too hot or cold, too humid or dry; too much abounding with Effluvia and Exhalations of any Sorts, &c. relatively with respect to the respiring Organs of this Person, in all or any of the said Properties; the joint Action and Effects of the Lungs and Air upon the Blood of this Person will become defective, whereupon the Blood, Chyle and Lympha, &c. not being perfectly elaborated, attenuated and assimilated, the same will become unfit for the Offices of Circulation, Secretion and Nutrition, whence must follow Diseases of all Sorts, as universal and particular Atrophies, Consumptions, Asthmas, Dropsies, Cachexies, Obstructions of the Glands, with Tumors, Ulcers, and cutaneous Distempers of all Kinds, scrophelous, scirrhus, cancerous, scorbutick, œdematous, inflammatory, &c. from whence it is evident that from a defective Respiration with respect to this its first principal Use, all the capital Diseases may be naturally and necessarily produc'd.

29. Moreover with respect to the last new principal Use of Respiration; let us suppose a Person's Lungs, from what Causes soever, whether it be owing to their own peculiar Structure, or from the Properties of the Air being relatively disproportionate thereto; or from the particular State and Constitution of the Blood; to be render'd incapable of performing what I have before suppos'd and assign'd as their second necessary and essential Office, namely, of secreting and discharging the Air out of the animal Fluids, as the same becomes too much heated and rarefied by the frequent Circulation and Attrition of the Fluids; now from a Defect in the Performance of this new principal Operation of the Lungs, Diseases of all Sorts may be produc'd, and particularly Fevers of all Kinds; the Origination, Increase, State, Decrease, with their Termination and Crisis, as also their several Characteristicks, Symptoms, Specifications, &c. may be much more naturally and necessarily produc'd, and more rationally accounted for from this Cause and Principle, than from any other of the many labour'd Hypotheses that have been invented, but without any good Foundation for that Purpose. And thus for Example, suppose the State of the Blood, from what Causes soever, to be such, that the Serum and Crassamentum are so closely united and combin'd together, that they will not readily separate and part from one another, in consequence whereof a general Obstruction and Resistance to the Circulation will be occasion'd throughout the several Series of Vessels, with a diminish'd Secretion in the Glands, and particularly in the Lungs, (a laborious and disturb'd Respiration being ever a necessary Symptom of such a State of the Fluids) so that the rarefied hot Air contain'd in the Blood can't be extracted and discharg'd thereout in sufficient Quantity by the Lungs, for Want of a proper Quantity of the serous or aqueous Part, which in this Case, by reason of its diminish'd Quantity, increas'd Viscidity, and close Vinculum and Union with the Crassamentum, will not readily separate and part therefrom; and being withal incapable by reason of its Viscidity, of exhaling through the Membranes of the Lungs, so that this internal Air in the Fluids being thus unduly retain'd and accumulated for Want of the serous or aqueous Part, which is its proper Vehicle and Menstruum for conveying the same out of the Blood through the Pores and Membranes of the Lungs; and this internal Air becoming more and more accumulated and rarified, and the Fluids expanded thereby, the whole vascular solid System will thereupon be brought to labour under a general Stimulation, with the Symptoms and Phænomena attending upon Fevers of all Kinds, and be put to the Necessity of exerting an universal Effort and Struggle to overcome and subdue this Lensor and Resistance in the Fluids; from which Conflict

lict and Struggle between the vascular glandular System, and the rarefied viscid flatulent Blood, either the Lensor of the Fluids will become dissolv'd, whereupon the Flood-gates of the several Glands that were barr'd up and obstructed by the viscid, hot, flatulent rarefied Fluids, being now set open, and the several Secretions coming to be perform'd in their natural Order, and particularly that of the internal Air being now discharg'd in due Quantities by the Lungs, the Vinculum and too close Union of the Serum and Crassamentum being now dissolv'd; whereby the Blood being now freed from this hot, windy Flatus and rarefied Air, will thereupon subside and circulate with greater Freedom, whereupon a perfect Crisis will ensue, the Fever vanish, and Health be restored. But on the contrary, if the Lensor be so great, universal, and deeply fix'd, as not to yield to the Efforts and Nisus of the Solids, then all Things will go on from worse to worse, until Death gives a final Quietus thereto. And thus from this Cause alone, Fevers of all Kinds may be produc'd, which will receive their peculiar Specifications, Appearances, Symptoms, States, Periods, &c. according to the Force and Momentum of the productive Cause, and as the several Glands and Viscera are more or less dispos'd to receive and retain the Impression and Determination of the morbifick Fluids, &c.

30. Having shewn that the Atmosphere, consider'd as operating continually by its variable Properties upon the Blood in the Lungs, is the general productive Cause of Diseases, so on the contrary, the same Air when apply'd and made to operate upon the Blood in the Lungs, with Properties and Qualities contrary to those by which the said Distempers were produc'd, will become the most natural perfect Method for curing the same; and this we observe from daily Experience to be true in fact, how that by a Change of Air only, Diseases become certainly, safely and radically cured, that could never have been effected without, by all the Assistance of Art and Medicines in Nature; thus for Instance, if the Air of any Place be comparatively too light, with respect to the constitutional Structure of the respiring Organs of any particular Person, upon his continuing in that Air, however healthfully constituted he may be in all other Respects, will become gradually diseas'd from this very Cause alone. Now there is no other possible Cure for such a Person but a Change of Air, either by going into some other Place or Country where the Air is generally observ'd heavier, or to have the Air where he lives render'd heavier by Art. But if the Person's Disease be owing to the Air's being relatively too heavy; it must be chang'd for an Air that is lighter, either such by Nature, or Art. If the Person's Disease be the Effect of an Air relatively too hot, it must be chang'd for one more cool and temperate, either such by Nature, or Art. But if the Disease proceed from the Air's being relatively too cold, the only Cure is an Air more hot, render'd such either by Nature or Art. If the Disease be produc'd from the Air's being too humid and damp, the same must be chang'd for one more dry, serene and warm, such either by Nature or Art. If the Distemper be occasion'd from the Air's being relatively too dry and cold, the same must be chang'd for one more moist and warm. If the Distemper proceed from the Air's being impregnated with Vapours or Exhalations of any Kind, Animal, Vegetable, Mineral, in order to obtain a perfect Cure it must be chang'd for an Air that is more open, pure, serene and persflated, and that is either free from such foreign Effluvia and Exhalations, or impregnated with Effluvia with contrary Properties, &c. And so for all other Alternations and Combinations of the several Properties and Qualities of the Air, consider'd as operating either singly or jointly, and that in all Degrees and Proportions. And thus we see that the Air, which is the general Parent and productive Cause of Diseases, becomes also the only perfect, safe, certain Remedy for curing the same, when it is apply'd and made to operate with Properties and Qualities contrary to those by which the same were produc'd, the Truth whereof is fully establish'd by the old physical Maxim; that all Diseases are only to be cured by Causes contrary and opposite to those by which they were produc'd, &c.

31. The Truth of the foregoing Propositions is abundantly evident and demonstrable, from observing only the different States and Changes which the animal Machine undergoes, by the different Properties of the Air in the several Seasons of the Year; thus in Summer the animal Solids being much relax'd, and the Fluids render'd viscid, rarefied and alkaline, by the great Heat, Rarefaction and diminish'd Pressure of the Air, People become in that Season, especially towards the latter End thereof, greatly dispos'd and subject to Diseases of the inflammatory acute Kind. But in the Winter the Air operating upon the Body with contrary Properties to what it did in the Summer, being now more heavy, dense, elastick, cold, humid, &c. by which the animal Solids become strengthned and contracted by the greater Pressure and Density of the Air, with the stimulating Force of the Cold, by which contrary Effects of the Air upon the Body during the Winter Season, many Diseases, especially of the inflammatory acute Kind, and such as are the Produce of the Summer Season or Air, become either perfectly cured, or at least undergo a general Remission. So that the Winter Season may not improperly be conceived as a State of Rest, wherein the animal Machine has its Solids and Springs wound up, strengthned, and repair'd for the ensuing Summer, which may be conceiv'd as a State of Motion and Exercise, wherein the Solids are relax'd, wasted and expended; and thus these two opposite extreme Seasons of the Year, and different States of the Air, serve to counterballance the Effects of each other; the Winter serving to cure the Diseases occasion'd by the Properties and Qualities of the Air in the Summer, as on the contrary the Summer serves to cure such Distempers as have been occasion'd by the different Pro-

erties of the Air in the Winter. Just in like Manner, and for the same Reason and Necessity with the alternate successive Changes of Day and Night; the Night (like to Winter) by the contrary different Properties and Qualities of the Air, to that of the Day, (which may be compared to Summer) serving to counterballance the Effects of the Air in the Day, and likewise to allow a proper Time of Rest and Relaxation to the animal Solids to become repair'd, nourish'd and wound up for the Exercise of the ensuing Day. As on the other hand, the different Properties and Qualities of the Air in the Day-time, together with the Exercise and Motion, serve to counterpoise the Effects produc'd by the different Properties of the Air in the Night. And thus the Night serves to cure the Diseases occasion'd by the Influence of the Air and Exercise in the Day-time; as the Day serves to cure the ill Effects produc'd from the Properties of the Air, and Rest, during the Night. And as the Properties and Qualities of the Air in the other two intermediate Seasons, of Spring and Autumn, differ only in Degrees from that of the two extreme Seasons of Summer and Winter; so the Effects or Diseases produc'd in the two intermediate Seasons, will differ only in Degrees from those in the two extreme Seasons.

32. As the Air is ever changing in respect of its Gravity, Heat, Cold, &c. it thereby acquires and maintains an absolute universal Dominion and Empire over all terrestrial Bodies; and the human Body being of all others the most exquisitely framed, becomes the most sensibly affected by its Influence. Now as there is an almost infinite Diversity in the Structure and Organization of the respiring Organs in different Persons; it is impossible that the Air of any Place or Country, let the Degrees of its Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, &c. be what it will, should exactly suit, fit, and have the same Effects upon all alike; and although it may agree well enough with the Generality of the Inhabitants, yet there are many who must suffer greatly therefrom: This unavoidable Inconvenience is however admirably and wisely provided for and ballanc'd, by the Atmosphere's being render'd thus subject to continual Mutations, as to all its aforesaid Properties and Qualities; upon which Accounts it becomes much better fitted for the Purposes of Respiration, with all the other various and different Offices and Degrees of animal Life, than if it had been permanently possess'd with the aforesaid Properties and Qualities in one and the same invariable immutable Degree; for was the Atmosphere always of one unalterable fix'd State, all Persons of what Make and Constitution soever, without Exception, would be quickly arrested with Diseases and unavoidable Death. But as the Atmosphere is continually changing with respect of its Properties, the ill Effects or Diseases, which it may produce by a Change either of one or all its Properties for any one Space of Time, will become again remedied and cured by a contrary Change of the very same Properties at another Time. Thus, for Instance, if either the Body or respiring Organs have too great a Pressure laid upon them, as the Atmosphere becomes heavier, so as to be anywise incapacitated for their respective Functions; upon the Atmosphere's becoming lighter, they will be restored to perfect Freedom and the full perfect Exercise of their respective Offices. And if either the Body or Lungs be too much relax'd by the too great Lightness, Warmth, and Humidity of the Air at any one Time or Season; they will again become contracted and render'd more elastick and compact, as the Air becomes heavier, cooler, and dryer, at another Time and Season. Again, if the Lungs suffer and are impeded in their Operation from any prevailing Fogs, Effluvia and Exhalations, they will become again reliev'd, as the Air becomes more serene, perslated, and free of such foreign Mixtures; and the contrary, and thus successively: So that by means of the above variable State of the Air, the Ballance between Health and Sickness is kept continually vibrating, either to one Side or the other, during the whole Period of Life. And this seems to be the final End and Design of Providence, in rendering the Atmosphere endow'd with such variable Properties and Qualities, whereby it serves as a perpetual Cause and Instrument for communicating Motion and Exercise, and thereby serve to maintain and keep up a continual Systole and Diastole propagated universally throughout the Bodies of Animals and Vegetables, and without which, Life in no Degree could subsist, &c.

33. Supposing the Air of any Place or Country to be ever so good with respect to the Generality of the Inhabitants, there will however (as has been before observ'd) be many who must suffer greatly therefrom, by reason of the Properties and Qualities of the Air being relatively disproportionate to the Structure and Constitution of their respiring Organs. If therefore a Method can be found for constructing an artificial Atmosphere, whereby the Air which a Person is to breathe withal may be render'd possess'd with such Degrees of Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, Effluvia, &c. just as he finds suits and agrees best with the present State of his respiring Organs; it is thereupon propos'd, that all such Diseases which are produced from an imperfect Respiration and Sanguification consequent therefrom, (which has already been shewn to be the general Source and productive Cause of all or most of the capital Distempers) and where the Lungs are yet sound and uncorrupted, will become perfectly, safely, and certainly cured thereby.

34. I come now, in the next Place, to describe the Solution of this most noble, useful Problem, relating to the Construction of an artificial Atmosphere to be apply'd to the Lungs; (in like Manner as that describ'd in the Second Chapter, is apply'd to the whole external Body) wherein I shall exemplify and shew, how the general Principles before laid down, relating to the mechanical

chanical Effects of the Air upon the Blood in the Lungs, may be reduc'd into Use and Practice; which will afford the most perfect, safe, universal Method both for Preserving Health and the Cure of Diseases. Now for understanding the Construction, Application and Use of this new artificial Atmosphere, serving for the Benefit of Respiration; for this Purpose, *vide* Section, Fig. 1. Plate 2. wherein let $BBBB$ be a Cylindrical or square Vessel of Tin, cast Brass, Iron, or Glass, which must be Air tight; either upon one End, or Side whereof, there is fix'd a small pneumatick Engine $zzzz$, (such as has been describ'd in the two First Chapters) or in lieu thereof a Syringe may serve upon Occasion; this pneumatick Engine communicates with the Vessel $BBBB$, by the Pipe rp ; the Axis dd of the Engine may be plac'd either parallel or perpendicular with the Horizon; by turning the Axis round either with a Winch or with horizontal Levers like as a Capstane, the Air may be thereby either condens'd or rarefied within the Vessel $BBBB$ to all Degrees requir'd, and the Degree of the Air's Density and Pressure within the Vessel, may be exactly known by observing the mercurial Gage Tube bb , (placed in the Vessel with Mercury $eeee$) with its annexed Scale; the upper Surface of the Mercury being denoted by the prick'd Line mm , upon which is pour'd some other Fluid, as Water, to the Height ww ; upon one side of the Vessel $BBBB$, (which for better Distinction I will name the respiring Vessel) there is joyn'd a Pipe rp , which I shall name the respiring Pipe, one End whereof p opens into the respiring Vessel, upon the End or Middle whereof is a Protuberance or Swelling, o , within which is a Valve opening outwards, which may be open'd and shut by means of a Spring, which the Person is to press or push with his Finger, as often as it is requir'd to let Air pass out of the respiring Vessel. Or if the End r of the respiring Pipe which the Person holds in his Mouth, be form'd somewhat resembling the Reed or Pipe of a Hautboy, with two thin smooth Plates made to joyn close by Help of a Spring, so as to permit no Air to pass inwards or outwards through the Respiring or Suction Pipe rp ; but upon the Person's taking the End r of the Pipe in his Mouth, and pinching the same between his Teeth, the Spring Valve commanding the Orifice of the Pipe will open, and upon his Sucking or Inspiring, the Air will come out of the respiring Vessel and expand or inflate his Lungs, and upon his quitting hold of the End r , of the respiring Pipe, the same will shut close of itself by the Spring Valve; and after the Person has expired or ejected the Air out of his Lungs into the external Air or Atmosphere, he returns again to the respiring Pipe, and taking the End thereof in his Mouth, receives thereby a fresh Charge of Air out of the respiring Vessel or artificial Atmosphere as before; and thus he may continue to do alternately or successively for any Time requir'd, with as much Ease and as little Trouble as Smoking of a Pipe of Tobacco. All Things being dispos'd in the Manner here describ'd, the Person taking the End of the respiring Pipe in his Mouth, let either the Person himself, or an Assistant for him, taking hold of the Winch dx , apply'd to the Axis of the pneumatick Engine $zzzz$, continue either to take out, or throw in Air into the respiring Vessel, through the injecting Pipe rp , until the Air therein has acquir'd that Degree of Density and Pressure, as the Person finds suits best to the present State of his respiring Organs, or as is judg'd will answer best for effecting the Alterations and curative Intentions propos'd. And having thus upon Trial found the precise exact State of Air, as to its Gravity and Pressure, which enables him to respire with the greatest Ease and Benefit, let him observe to what Division or Number the Mercury is rais'd within the Gage Tube bb , and by observing to keep the Air in the respiring Vessel always to this standard Degree of Density, he will thereby become furnished with an artificial Atmosphere for to breathe withal, and render'd at all Times, or for as long as he finds Benefit thereby, of one uniform Degree of Gravity and Pressure, and most exactly prepar'd and fitted, so as to suit and agree the best and easiest possible with the present constitutional State of his respiring Organs. So that if the Person takes but Care only to inject as much Air into the respiring Vessel, as he draws out of the same by the respiring Pipe, at each Inspiration, (which will require no great Trouble nor Force to effect) which he may know by observing to keep the Mercury rais'd to the proper standard Height in the Gage Tube; by which Means the Air in the respiring Vessel or artificial Atmosphere, will be kept always sweet, pure and fresh, as well as of a uniform equal Gravity and Pressure; and by placing the respiring Vessel higher or lower upon a proper Stand or Frame, the Person may thereby use it either Sitting, or Standing, as is most convenient. It is however to be remark'd, that the Person in using this artificial Atmosphere, must not breathe or receive any Air by his Nostrils, which must be kept close shut, by means of a Spring Wire, or such like Contrivance, apply'd outwardly and made to press the Wings of his Nose close together.

35. By the mechanical Method here describ'd, a Person may have the Air he is to breathe withal, so prepar'd and fitted in respect of its Gravity, Elasticity and Pressure, so as to agree the best possible with the organical Structure of his respiring Organs, let the same be ever so particular. So that if the Person's Lungs, &c. be of a relax'd weak Texture, as not to bear with an Air very heavy and elastick, in such Case he may prepare and fit his artificial Atmosphere for to operate with a proper Weight, Density and Pressure accordingly; and on the contrary, if the Lungs be of a strong, firm, dense Texture, so as to require a more than ordinary Degree of Gravity, Elasticity and Pressure in the Air to produce a full Inflation of the Vesicles, and to give full Liberty to the pulmonick Blood Vessels to dilate, and give more room for the Fluids

to circulate therein; so also in this Case, he may have the Air in the respiring Vessel render'd most exactly of a Force, as to its Gravity, Spring and Pressure suitable and fitting thereto.

36. Having shewn how the Properties of the Air, namely, its Gravity, Elasticity and Pressure, may be apply'd and made for to operate upon the respiring Organs, with all assignable Degrees; now as to the Qualities of the Air relating to Heat and Cold; it will be easy to conceive how those two general Intentions of heating and cooling the Air in the respiring Vessel, may also be obtain'd to any Degree requir'd, by many artificial Contrivances, as suppose the pneumatick Engine zzzz, to be supply'd with Air by two Pipes, to each whereof is join'd a spiral Pipe or Worm, one of which is plac'd in a Refrigeratory or Vessel with cold Water, and the other in a Vessel with hot Water, (neither of which Worms are express'd in this Draught to avoid imbarassing it with too many Lines) each of those Worms must have a Cock to let the Air into the Engine, either through the hot or cold Pipe, or out of both together; thus upon shutting the Cock through which the hot Air is convey'd, and setting open the Cock of the Pipe by which the cold Air is furnish'd; the respiring Vessel may be kept from Time to Time supply'd with fresh Air, which in passing through the several spiral Convolutions of the Worm, plac'd in the Vessel of cold Water, which may be impregnated with Sea Salt or Sal Armoniack, the Air in the Receiver may be render'd of various Degrees of Cold, so as in Summer to be render'd as cold as in Winter. And the other Worm being plac'd in a Vessel with boiling Water or Oil, the Air in passing through it may be made to receive different Degrees of Heat, so as to be render'd as hot in the Depth of Winter, as it is in the Middle of Summer. By which Method the Air in the respiring Vessel or artificial Atmosphere may be prepar'd for to operate upon the respiring Organs, with all proper Degrees of Heat and Cold, as well as Gravity and Pressure. Which Degrees of Heat may be varied from that which produces freezing or lower, upwards to the greatest natural Heat of the Air in Summer, or higher upon Occasion; all which several Degrees of Heat thus communicated to the Air in the respiring Vessel, may be exactly known and regulated, by observing the Thermometer $\tau \tau$, with its annexed Scale; and when the Person upon Tryal and Experiment finds what Degree of Heat in the Air, agrees best with his respiring Organs, let him remark the Division or Number to which the Fluid stands rais'd within the Tube of the Thermometer, and by taking Care to keep the Fluid always elevated to the same Height in the Tube, he will thereby know that the Air of the artificial Atmosphere has its proper intended Degree of Heat, by which Means the Person will become supply'd with Air to breathe with, and fitted exactly as to the Degrees of Heat, as suits best with the present Temperament and State of his Lungs, &c.

37. Now in order to render the Air of this artificial Atmosphere of a proper Temperament as to the Degrees of Humidity. To answer this Intention, the respiring Vessel must communicate with another Vessel or Copper vvvv, by means of the Pipe v d, which Copper being fill'd with pure Water as high as the prick'd Line u u, by applying a proper Heat to the Copper sufficient to raise Steam or Vapours therefrom, which being collected in the upper Part of the Copper, upon opening the Cock of the Steam-pipe v d, the Vapours may be let into the respiring Vessel, until the Air therein is sufficiently impregnated therewith, and to know the Degrees of Moisture in the Air within the respiring Vessel, there may be a Hygroscope apply'd either within-side or without side the respiring Vessel for that Purpose. And if in case the external Air or general Atmosphere, from which the respiring Vessel is supply'd, be either naturally from the Situation of the Place, or accidentally render'd too moist, many Ways may be used to render the Air of this artificial Atmosphere of a proper Temperament as to Dryness; such as causing the Air before it enters into the respiring Vessel for to pass through warm dry Sponges, or other such like Substances fit to absorb and imbibe the Moisture of the Air, or the Air may be made to pass through warm dry Pipes plac'd in hot Sand or Bricks, before it is receiv'd thro' the Pipe w p into the pneumatick Engine, to be injected into the respiring Vessel; with many other such like Devices and Contrivances too tedious to be here more particularly detail'd.

38. By the Methods propos'd in the foregoing Numbers it is evident, that a Person may be supply'd with Air for Respiration, endow'd with all possible Degrees of Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness; and moreover when the Case so requires, the Air in the respiring Vessel may be impregnated with Vapours or Effluvia, either humid, or dry, produced from Materials of all Sorts, animal, vegetable and mineral; the Ingredients whether solid or fluid are to be put into the Copper vvvv, and upon applying a proper Degree of Heat thereto, either by Ebullition, Accension, Attrition, &c. the Vapours will become rais'd to the upper Part of the Copper, and upon turning open the Cock of the Steam-pipe v d, the Vapours will pass through it into the respiring Vessel, and when the Person finds the Air to be strongly enough impregnated therewith, upon shutting the Cock of the Steam-Pipe, no more Effluvia will be permitted to come into the respiring Vessel until they are wanted; and which will answer best in most Cases is, for to have the Vapours thrown in by little at a Time successively, just as fast as they become expended, and not all at once; and for this End the Steam-Pipe must be made to communicate with the pneumatick Engine by the Pipe c c c p, whereby the Vapours are conducted first into the Engine, out of which it is thrown gradually, being mix'd with the external Air, into the respiring Vessel; so that by this Method a Person may have the Air he is to breath with render'd possess'd with the Effluvia and Exhalations of all Sorts of Bodies, as are judg'd to be any Ways subservient for

for to answer any curative Intentions with respect to the respiring Organs; either for contracting, relaxing, strengthening, heating, cooling, humecting, drying, resolving, fumigating, &c. in the like Manner as has been shewn in the two first Chapters, with respect to the external Body. So that by having the Air in the respiring Vessel thus properly medicated and balmified, with Vapours, Odours and Effluvia from all Kinds of proper Substances and Ingredients, a Person may be put in a Condition in the Middle of Winter, for to breathe the same benign, pure, tepid, dry, salubrious Air, impregnated and aromatiz'd with the same sanative balsamick Particles, as he could do by going into the finest Flower-Garden in the Summer Season; which Method of fumigating the Lungs with Air thus artificially prepar'd and medicated, will be of great Service in curing many of the Diseases of this most noble capital Organ.

39. Moreover, in order to give the Person all the Benefit that can be derived from the Air, at the same Time as he breathes with an Air thus artificially prepar'd, medicated, and fitted in all Respects so as to agree with the present State of his Lungs, he may have his whole Body at the same Time submitted to the Operation of another artificial Atmosphere, by inclosing his Body in the Vessel B B B B (as is shewn by the other vertical Section, Fig. 2. Plate 2.) which Vessel with its Apparatus is constructed in the same Manner with that describ'd in the second Chapter. The Person either sitting or standing within this Vessel, may have the Air incumbent upon his Body render'd of what Gravity, Elasticity, Pressure, Heat, Cold, Humidity, &c. as is judg'd will answer best with the Symptoms and Indications of his particular Case; at the same Time as the Air in the respiring Vessel x x x x, is fitted and prepar'd so as to agree exactly with the State of his Lungs. In this Draught the Air incompassing the Person's Body within the Vessel B B B B, has its Properties and Qualities fitted and adjusted with respect to its Density and Pressure, &c. by means of the pneumattick Engine a a a a, but the Air in the respiring Vessel x x x x has its Properties adjusted and regulated by the other pneumattick Engine z z z z; however any one of those two Engines may serve for both Purposes. So that by this Method a Person may have the Air duly fitted and prepar'd for to operate at the same Time both upon his Body, and respiring Organs, and that with all Degrees of Gravity, Elasticity, Heat, Cold, &c. as suits best with the Intentions of Cure in both.

40. By the Methods here describ'd of artificially preparing, medicating and accommodating the Air with respect to all its known Properties and Qualities, and of applying and causing the same to operate jointly or separately, and with such a proper Degree and Quantity of Force, as suits relatively best with the constitutional State and Structure of the respiring Organs in every individual Person, let the same be weak or strong, young or old, &c. (providing they have no original wrong Conformation or hereditary morbid Impressions) from which it is propos'd the only natural, perfect, safe, universal Method will be obtain'd for the Cure of all Diseases which proceed from an imperfect Respiration and Sanguification, or from the Lungs and Air not having their relative Properties and Forces duly proportion'd to each other. It being absolutely impossible ever to expect a perfect Cure of the Diseases proceeding from this Cause (and to which most of the capital Distempers owe their Original and Growth) by any other Medicines or Means in Nature, but only by such or the like proper Methods of applying the Air to the respiring Organs, in the Manner as before describ'd, join'd and assisted with the other new Methods of Health contain'd in the other Chapters of this Essay. And this we find confirm'd from daily Experience, how that Persons labouring under Asthmas, Consumptions, Agues, Atrophies, Cachexies, Hecticks, Dropsies, relax'd Solids, &c. with such other Diseases as derive their Origin from a defective Respiration and Sanguification, become very sensibly affected by the different Gravity, Density, Pressure, Heat, Cold, Humidity, &c. of the Atmosphere; now there is no absolute Relief to be found against those Changes in the Properties of the Air; for let a Person change his Habitation to any Part of the Earth, he must still expect to meet with the same changeable Atmosphere, although in some Countries, especially towards the Equator, the Air in respect of some of its Properties, is not subject to so great and sudden Alterations, as in more northerly Climates, yet even this material Inconvenience, and which admits of no Relief any other Way, may notwithstanding become perfectly remedied by this new Method, for suppose a Person to be asthmatick, by means of this new respiring Machine he can bring the Air to be of such a Disposition and Temperament in respect to all its Properties, as shall exactly fit and suit best with the present State of his respiring Organs; and when upon Trial he has brought it to such an exact Adjustment and Standard, he may continue and keep it so for as long as he pleases, or finds Benefit thereby; and when he finds his respiring Organs grow stronger, and that they require and can bear with an Air endow'd either with a greater or less Degree of Gravity, Heat, Cold, &c. he can prepare and render this artificial Atmosphere possess'd with those Properties and Qualities accordingly, &c.

41. Moreover we find a Change of Air to be the only true natural perfect Cure in Cases of Consumptions, Agues, Asthmas, Cachexies, &c. and the Reason why it misses, is chiefly for want of knowing what Properties and Qualities the Air ought to have, which should be always contrary to those by which the Diseases was produc'd; and thus the changing of a damp, cold, light, foggy Air, for one more heavy, dry, warm, serene and persflated, will do more towards the Cure of such Diseases, when occasion'd from those or the like Constitutions of the Air, than all

the Remedies in Nature. But whereas most People's Condition and Circumstances will not allow them to change their Habitation, or go into other Countries, where the Air is reputed more salubrious, now all those Intentions may be answer'd, and in many Respects more universally and better, than can be done in any Part of the Earth; for as has been shewn before, by this new Method the Air which a Person is to breathe withal, may be not only endow'd with all the requisite Properties and Qualities that suits best with the State and Structure of his respiring Organs, but this Air or artificial Atmosphere when thus prepar'd and adjusted, may be kept possess'd with the very same Properties, and in the very same Degrees, for any Space of Time requir'd, and that in all Seasons of the Year, Spring, Summer, Autumn and Winter, all equally alike; which is a very momentous important Point gain'd hereby; in that this universal Remedy of Nature's Appointment, can have its Properties and Qualities chang'd and alter'd at Pleasure, and fitted for operating with all Degrees, Quantities, Proportions, Alternations and Combinations, both upon the whole external Body, as also upon the whole System of the Fluids in the Vessels of the Lungs, and this at all Times and Seasons, and in all Places, and with respect to all Persons whatever. And besides the Air which the Person thus breathes with, may be aromatiz'd and impregnated with Effluvia produc'd from Earths, Vegetables, &c. brought from such Countries as are esteem'd the most healthful, whereby the same may not only be render'd an universal Bath for Irroration and fumigating the Lungs, but be made for to resemble the Air of any particular Place or Country, with respect to the extraneous Effluvia and Exhalations wherewith it is saturated, such as that of *Montpelier*, or *Italy*, &c. so that without going to either, a Person may by this Method be put in a Condition of enjoying all the same good Effects and Benefit from the Air here at Home, by having the same thus artificially prepar'd, medicated, aromatiz'd, and balmified, &c. as has been shewn in the preceding Numbers.

42. It is not here propos'd nor intended that a Person can apply or make use of such an artificial Atmosphere constantly; it will be sufficient if the same be used at proper Intervals, and for a reasonable Time, like to any other Kind of Exercise or Regimen, prescrib'd either for the Preservation of Health or the Cure of Diseases; and being thus duly and regularly pursued, will not fail in due Time to effect a perfect Cure of all the aforesaid capital Diseases.

43. Moreover as the Lungs are a compressible, vascular, elastick Machine, and the whole System of the Fluids is made to circulate successively through the same, wherein they become in a manner fully expos'd and laid open, under Cover only of innumerable fine transparent flexible elastick Tubes, to receive the salutary Effects and Operation of the Air; for which Reason this Organ the Lungs, appears to be much the most natural proper Place to begin at, in order to cure the Diseases of the Fluids; and it seems surprising to me that no Attempts of this Kind have hitherto been made for improving so valuable an Opportunity and constant Access as is hereby afforded us of coming at the whole Mass of Blood; the All-Wise Author of Nature having plainly shewn and pointed out to us, that the Design and final End of instituting this compound Organ or Machine the Lungs, was for to prepare, repair, and preserve the Fluids in a fit State and Condition for performing their respective Offices, and as such appears from the Appointment of Providence, to be the most proper Place and Organ to begin at in order to effect a perfect Cure of all the Diseases relating to the Fluids, to which we can have a constant, immediate and full Access at all Times as they circulate through this complex Organ, without taking such a long, uncertain, remote round-about Way for effecting those Changes in the Fluids, by means of Medicines exhibited internally, and convey'd thereto by way of the Stomach (according to the present Practice) the Effects whereof are always uncertain, and oftentimes fatal and dangerous; whereas all the same curative Intentions may be much more safely and certainly effected, only by causing the Air to operate upon the respiring Organs, with its Properties and Qualities so regulated and adjusted, as will best answer to produce the Effects and Intentions wanted, as has been shewn in the former Numbers.

44. As we are taught by Experience and Observation, to regard the Air at all Times as Nature's great Instrument for regulating animal Life and Health, so we must not forget at the same Time to be upon our Guard, as it is also the most subtil Agent and productive Cause of Diseases. Now there are two principal Ways whereby we receive both its good and bad Effects; the first is by its general Action upon the whole external Body; and the second is by its Operation upon the respiring Organs, wherein both its good and bad Effects are chiefly manifested. Now in the second Chapter I have shewn a Method whereby all the salutary good Effects, arising from its general Operation upon the whole external Body may be obtain'd, and all its bad Effects remedied and prevented, by means of an artificial Atmosphere properly prepar'd with respect to all its Properties and Qualities, and made to operate with a proper Force upon the external Body, whereby all the curative Intentions both of the Solids and Fluids may be most effectually obtain'd. And in this Chapter I have describ'd a Method, whereby all the good Effects produc'd by the Operation of the Air upon the respiring Organs may be obtain'd, and all its bad Effects cured and prevented; by means of another artificial Atmosphere properly prepar'd, and made to operate with a due Force upon the Lungs; by which Means that natural Organ and Engine the Lungs, will be rendered an artificial pneumatick Engine, as being now brought under the Management and Direction of humane Art, in such wise that it may be regulated, adjusted and

fitted like as a Corn-Mill, whereby all the Intentions wanting in the Fluids may be most perfectly obtain'd, as they may be ground coarser or finer, and have their Texture, Crasis and Temperament repair'd, mended and manufactur'd at Pleasure. So that these two new general Methods of applying the Air to the whole external Body, and respiring Organs, will afford the most perfect universal Means for preserving Health, and curing all Diseases, that are curable, both of the Solids and Fluids.

45. The Lungs have already been consider'd and compar'd to a Pneumatico-Hydraulick Engine, whereby the animal Fluids are constantly elaborated, ground, mix'd and assimilated, &c. Now as there is an universal Analogy to be observ'd throughout the whole Cr  ation and Works of Nature; and as humane Art is no other than copying, assembling and disposing of Things in Imitation of Nature; for farther Illustration of this Point, let us consider a little more particularly the Analogy and Resemblance between this compound Engine of Nature, the Lungs, and that of a Windmill or any Engine apply'd for forcing Water by the Power of the Wind, or of the Air in Motion. Now there are only two Ways whereby the Motions of such an Engine can be truly regulated; that is, by placing the Sails either spread fully open, or contracted in a proper Position and Degree of Obliquity to the Current and Stream of the Air; or by intercepting Part of the Wind by the Interposition of some Body, and causing it to act more or less upon the Sails; the first is the Method now in Use, but the latter, tho' not without its Advantages, hath never that I know been put in Practice. Now to bring this Comparison home to the Lungs, the Powers employ'd in the Motions of this compound Organ or Engine, are the Air, together with the organical Structure and muscular contractile Force of the pulmonary Vessels, and the other Muscles serving to Respiration: Now there is but one Way whereby we are allowed Access, or can pretend to regulate and govern the Motions of this compound Engine of Nature; for as it is not in our Power to alter or mend the original Structure and Mechanism of the Lungs and respiring Organs, as we can do that of an artificial Engine; we have only one Way left whereby to regulate its Motions, and that is by accommodating and fitting the Air with all its Properties, and causing them to operate with a proper Momentum and Force thereupon; and as this last Method may be done by proper Machines, consequently we may regulate and govern the Motions of this compound Organ or Engine, after much the same Manner as we do that of a Windmill; for as by placing the Sails either spread open or contracted in a proper Degree of Obliquity to the Wind, we can either accelerate and retard, or augment and diminish its Motions, with the Effects depending thereon; even so in like Manner by applying the Air with its several Properties and Qualities, and causing it to operate with a proper Force and Momentum upon the Lungs and respiring Organs, we can either accelerate, retard, augment and diminish their Motions, with the Effects produc'd thereby in the animal Fluids, as they circulate successively thro' the Lungs; the Effects of which Motions extend not only to the Region of the Thorax, with its Contents, but to that of the Abdomen also, with all the Viscera, Organs, Glands and Vessels, &c. contain'd therein.

46. Now in order to illustrate by a linear Representation and Draught, the Effects and Alterations that may be thus produc'd by the Air and its Properties, when apply'd by proper Machines, and in proper Quantities and Proportions, to the Lungs; I have for that Purpose, in the Picture or Figure of the humane Body, in Fig. 1, and 2, Plate 2, represented the external Surface of the Thorax and Abdomen, (both which Regions, &c. are subject to the Influence and Dominion of Respiration) as defined by two parallel Lines, the outermost whereof being a real one, but the innermost a prick'd or dotted one; and the Interval or Space between the said Lines, serves to denote and express how much the Motions of the respiring Organs, with the Cavities and Contents of the Thorax and Abdomen depending thereon; may be expanded or contracted, accelerated or retarded, augmented or diminished, &c. and that in all Degrees and Quantities, as will answer best with the preventive, preservative, and curative Indications, &c.

47. That the several new mechanical Practices and Methods describ'd in this Chapter for preserving Health, and the Cure of Diseases, are just, true and reasonable, and must be attended with all the Advantages that have been ascrib'd thereto, requires no other Proof or Demonstration, than that of their being perfectly conformable to the establish'd Order and settled Methods which Nature pursues for attaining the same Ends. If any think this Method of practising, arguing, and demonstrating, grounded on an Analogy and Conformity with the establish'd Order and Laws of Nature, as not conclusive and sufficient, they are at full Liberty to produce a better, if they can.

C H A P IV.

General Reflections relating to the mechanical Effects and Influence of the Air upon Animal Bodies, consider'd under the Head of Exercise; wherein is describ'd the Construction and Use of a new Machine and Method of applying the Air to the humane Body in such a Manner, as to become the most perfect and salutary of all Kinds of Exercise; as also the most efficacious universal Remedy for the Cure of most of the capital Diseases incident to Mankind.

1. **H**AVING in the second Chapter, with the other Parts of this Essay propos'd and describ'd a new Method for constructing an artificial Atmosphere, whereby the mechanical Properties and Qualities of the Air may be directed and made to operate upon the humane Body, with all Degrees of Force, and in all Alternations and Combinations. Having also in the third Chapter describ'd another new Method whereby the Air may be apply'd and made to operate upon the respiring Organs, with its Properties and Qualities intended and remitted in all Degrees, and Proportions, either jointly or separately. By a judicious Use of which two new Methods it is propos'd, that the most perfect, safe, universal Practice may be establish'd for the Cure of Diseases. I shall come now in the next Place to propose another new mechanical Method of applying this great universal Cause and Instrument the Air, to the Body; from the Effects and Influence whereof many singular Advantages will be obtain'd, as being the most perfect of all Kinds of Exercise for preserving Health and Cure of Diseases. But in order to open up and prepare the Way for the more readily and distinctly apprehending the Reason, Effects, and Benefit thereof, shall premise the following Observations.

2. Among all the Non-Naturals and Means of Health, none contribute more thereto, than Air, and Exercise or Motion; now the real End, Effects and Design of all Exercise of what Kind soever, is to communicate a proper Quantity of Motion to the animal Solids and Fluids, to contract, brace and strengthen the former, and dissolve, attenuate and keep the latter in a due State of Tenuity, Heat and Fluxility, for performing the Offices of Circulation, Secretion, Nutrition, &c. Now to this one general Head of Exercise, or communicating Motion to the Solids and Fluids; all Medicines, Methods and Means for preserving Health and curing Diseases, may be truly and properly referr'd, as the same can have no other End or Intention, nor capable of producing any Effects, other than what result from the Quantity of Motion impress'd and communicated to the animal Solids and Fluids, with the Direction and Determination of that Motion. Now the Methods for communicating Motion or Exercise to animal Bodies are of various Sorts, either natural or artificial; under the first Head may be reckon'd Aliment, Walking, Fire, Air, Passions, &c. and under the second Class may be refer'd all Medicines and Means either for preserving Health, or the Cure of Diseases, as Bathing, Riding, Emeticks, Catharticks, Diureticks, Sudorificks, Salivaticks, Frictions, Epispasticks, Causticks, Cupping, Scarefying, Phlebotomy, Ophthalmicks, Odontalgicks, Cephalicks, Opiates, Stimuli, &c. However I think it may be truly affirm'd of one and all the aforesaid Methods of Exercise, especially those of the second Class, that by what ever Methods the Body is exercis'd, there is a greater Stress laid upon some Parts more than others, or which comes to the same Thing, that Motion is not communicated to all Parts equally and alike, the Effect and Consequence whereof will be an unequal Derivation and Revulsion of the Fluids to, and from, particular Parts of the Body; the Fluids being always necessarily determined in the greatest Quantity and Velocity, upon the Parts where there is the least Resistance. Consequently that Kind of Exercise whereby Motion is most equally communicated and distributed to all Parts, both Solids and Fluids, must necessarily be the most natural and perfect, and the best for preserving Health, and for the Cure of Diseases. Of which equable uniform Method of communicating Motion to a System of elastick, contractile, distractile Tubes, such as are the Bodies of Animals and Vegetables, Nature has furnish'd us with two of the most admirable perfect Instances of this Kind; the first is that of the compound Action of the Lungs and Air upon the whole System of the Fluids, as they circulate successively through the Vessels infinitely divaricated throughout the vesicular membranous Substance of the Lungs, by which alternate equable Systole and Diastole of the Lungs, Motion is communicated to the Blood and all its Parts equally and alike, whereby the whole System of the Fluids receive the Benefit of a constant and most perfect Exercise, from the Motion that becomes impress'd thereon by the Air, as it circulates through the pulmonary Vessels, whereby it becomes as it were Wire drawn, dissolv'd, attenuated, and has all its component Principles perfectly assimilated and fitted for all the Offices of the Œconomy, &c. The second Example of perfect Exercise which Nature presents us with, is likewise deriv'd from the same universal Instrument and Cause, the Air, consider'd as apply'd and operating upon the whole external Body; for as the Atmosphere being a Fluid subject to perpetual Changes as to its Gravity, Elasticity, Heat, Cold, &c. it becomes a constant Cause and Instrument of communicating Motion and Exercise to animal and vegetable Bodies, as consisting of an Assemblage of elastick Tubes fill'd with Fluids capable of being greatly rarified and condens'd,

dens'd, and being always immerg'd into and encompass'd round therewith; from the variable State of which Fluid in respect to its Properties and Qualities, animal Bodies become subject to a universal Motion of Systole and Diastole, or of contracting and expanding, during the whole Period of Life; and this universal Agitation and Oscillatory Motion thus continually communicated and impress'd upon the animal Machine by this variable Cause the Atmosphere, instead of being prejudicial, is absolutely necessary in the present State of Existence, towards the Production, Preservation and Continuance of all Degrees of Life, in Animals, Vegetables, Fire, &c. and without the constant Influence of which natural Motion and Exercise thus deriv'd from the Air, our own as well as all other Bodies about us would become arrested and fall into a State of absolute Rest, Inactivity or Death. Now in both the Examples of Exercise here produc'd, it is to be observ'd, that our Bodies become exercis'd or have Motion communicated thereto by the Air, which in the first Case is apply'd and made to act upon the animal Fluids as they circulate successively through the Lungs; and in the second Case is apply'd and acts upon the whole external Body, and by consequence upon the whole System of the Solids and Fluids. Now the Air being an elastick Fluid endow'd with its other variable Properties and Qualities, becomes on that Account the fittest and best adapted Cause and Instrument for communicating Motion and Exercise to a System of elastick Tubes, fill'd with compressible Fluids, as are the Bodies of Animals, &c.

3. From a due Consideration of the aforesaid two beautiful notable Instances and Cases, wherein it has been shewn, that our Bodies are kept in a perpetual State of Exercise, by the Motion that is continually communicated thereto, by the ever changing Properties of the Air, without which constant natural Exercise, Life in no Degree could subsist. Taking then the aforesaid two Cases for a Model, Pattern and Exemplar of the most perfect and healthful Method of exercising or communicating Motion to animal Bodies, as being the Method practis'd by the Author of Nature, and prescribed to us for our Imitation; conformable whereunto, I come now to describe another new mechanical Method for exercising and communicating Motion to the animal Machine, by a new Manner of applying and causing the Air to operate thereupon, in a Method somewhat analagous, and in Imitation of the joynt Action of the Lungs and Air upon the Blood, as it circulates successively thro' that Organ.

4. For this Purpose vide vertical Section, Fig. 7. Plate 2, wherein let B B B B represent a cylindrical Barrel, plac'd with its Axis perpendicular to the Horizon; and may be of Cast Iron or Brass, from one, to three Feet diameter in the Bore, and from five, to ten Feet in Height; upon the upper End of this Barrel which is open, there is fix'd across the Middle of the Bore, a strong flat Iron Bar m m, in the Middle whereof is a round Hole, within which there moves a strong cylindrical Iron Rod r r, to the lower End whereof r, is fix'd a Piston or Forcer F F, which may be a Plate of Iron or Brass, turn'd for to fit the Bore of the Barrel, and to cause the same to move or work truer therein, it may be arm'd with Leather upon both Sides, and upon the upper Side of the Forcer there may be some Water, to prevent any Air from getting in or out between the Barrel and Forcer; to the upper End r of the Iron Rod there is fix'd at right Angles thereto a Piece of Wood t t, the two Ends whereof move perpendicularly up and down in a Channel or Groove form'd by the upright Pieces or Cheeks s d, s d; which together with the horizontal Pieces c c, serve as a Frame for fixing the Machine; to the Middle of the sliding Piece t t, is fix'd a Ring or Eye-bolt R, with a Rope or Chain fix'd thereto; which being carry'd over the Pulleys z and q, has a Weight P fasten'd to the other End, which Weight as it descends, causes the Iron Rod r r, with the Piston or Forcer F F, to ascend upwards; to the under Side of the Piece t t are fix'd two other Rings 2, and 4; to each whereof is fasten'd the End of a Rope or Chain, which being carry'd underneath the Pulleys 1, and 3, are afterwards wound several Times round the Groove of the Wheel x x, to which they are made fast; by the winding on, and off, of those Ropes in the Groove of the Wheel as it moves round one Way or the contrary, the Piece t t with the Iron Rod r r, and Forcer F F, are determin'd and made to move forcibly downwards, at which Time the Weight P will be rais'd upwards; and upon slackening the Ropes and letting the Wheel move round with a revers'd Motion the contrary Way, the Weight P will thereupon descend, and cause the Forcer F F, to move upwards within the Barrel; w w is another Wheel fix'd upon the same Axis A A, to the Groove of this Wheel there may be fix'd the Ends of several Ropes w 1, w 2, &c. which Ropes after taking one or two Turns round in the Groove of the Wheel, may be carry'd out in all Directions therefrom; to each of which Ropes there may be apply'd any Number of Men, who upon pulling the Ropes cause the Wheel to turn round, whereupon the other Ropes x 1 2, x 3 4, in winding on upon the Wheel x x, will cause the Iron Rod r r, and Forcer F F, to move downwards in the Barrel, and that with any Velocity requir'd; and according as the Wheel w w moves a less or greater Way round, so the Piston or Forcer F F, will be rais'd higher or lower in the Barrel proportionally, as suppose to the several Heights F 2, F 3, F 4, F 5, &c. as the Stroke is requir'd to be made stronger or weaker, (as to the Construction of the Axis A A, with the Manner of applying the Power of Men thereto, I shall not enter upon a more particular Description thereof here, having in another Paper relating to Mechanicks, with the Construction of the Capstane and Windlass, been particular upon that Subject, wherein I have describ'd a new Method both for constructing and working the same; whereby those two mechanical Organs will be render'd of much greater Force and more commodious in all Cases, but more especially on

board of Ships, &c. to which Paper I must refer for Brevity) to the lower End of the Barrel there is joyn'd a short Pipe with a Flanch, by which it is joyn'd with Screws to the other short Barrel R R R R R R, which may be either Square or Cylindrical, and of a Capacity to receive the Body of a Person fitting therein, as represented by the Picture or Image in the Figure; this Barrel, wherein the Person is shewn sitting, (which for better Distinction I shall name the Receiver) is close shut at the upper End, only in the Middle whereof is a Hole, which may be open'd or shut upon Occasion by a Valve or Plate y, fitted to the Cover R R, either by a Rivet or Hinge; in the Bottom of the Barrel B B B B is a Hole, over which is placed a Valve u, opening inwards and outwards.

5. All Things being thus dispos'd in the Manner as before suppos'd, and the Person being seated within the Receiver, upon raising up the Forcer to any Height within the Barrel, as suppose to F 2, the Valve u, opening at the same Time inwards, the Air will enter thereat and fill the Space produc'd by the Motion of the Piston or Forcer upwards; which being done, let the Men begin to pull the Ropes w 1, w 2, whereupon the Forcer will be made to descend forcibly from the Height F 2, until it comes to the lowermost Situation F F, by this Stroke of the Forcer in descending from F 2, to F F, the Air in the Receiver will become gradually condens'd around the Person's Body, suppose now the Air in the Receiver R R R R, by this Stroke of the Forcer, to be condens'd into half the Volume or Space occupied by common Air, in this Case the Person in the Receiver will be compress'd with a Weight double of what he would sustain from the Pressure of the Atmosphere alone, or he will sustain an additional Weight equal to about 40,000 Pounds; or equal to what he would sustain by being immerg'd to the Depth of thirty five Feet under Water in the open Air. Now the Effects of such great additional Pressure being laid upon the Body, will be, that the whole external Surface of the Body being equally and strongly compress'd, the Effects of which Pressure being propagated inward to the very Center or Axis of the Body, throughout the whole vascular and glandular System, whereupon the Blood by this universal Systole and Contraction, will become triturated, dissolv'd, and attenuated, just in like Manner as the Blood becomes ground, elaborated, and assimilated by the Descent and Pressure of the Air upon the Blood Vessels of the Lungs, upon every Act of Inspiration and Expiration; now we may conceive the Person in the Receiver upon every condensing Stroke of the Forcer, to become subject to the like similar Changes, as he would be in the external Air or Atmosphere, upon its Changing from being lightest to heaviest; the Difference between which two extreme States, is about one tenth Part of the Air's whole Weight, whereas in this Case it is double of its whole Weight, and consequently the Effects produc'd in the Person's Body by this Stroke of the Piston or Forcer, will be twenty times greater than what he would have undergone by a Change of the Atmosphere from lightest to heaviest. The Forcer having made the descending Stroke, let it be rais'd up to the same Height F 2, as before, in order to make a second Stroke, (now this Motion or Stroke of the Forcer upwards within the Barrel, is produc'd by the leaden Weight p being permitted to descend, upon the Men's ceasing to pull the Ropes w 1, w 2, &c. whereby the Forcer being push'd upwards by the Spring of the condens'd Air in the Receiver, becomes easily rais'd up) observing to let the Forcer take the same Time in the rising or ascending Strokes, as it does in the falling or descending Strokes: Now all the Time the Forcer is moving upwards, the Air about the Person's Body in the Receiver becomes gradually more and more rarefied, as the same has now more room to evolve its Spring, so that when the Forcer is rais'd to F 2, the Air in the Receiver will be of the same Density, Weight and Pressure, with the external Air or Atmosphere, so that the Person will now be restored to the same Degree of Pressure from the Air as he sustain'd at first. And whilst the Forcer is making the rising or ascending Stroke, the additional Pressure that was before laid upon the Person, by the Condensation of the Air, will be taken off gradually again, and in the same Time as it was laid on; in which Case the whole elastick vascular System, being now less press'd upon, will thereupon undergo and become subject to a universal Diastole or Expansion, from the Center or Axis of the Body outwards to the Circumference, with a contrary Nisus and Direction to what it did before upon the Stroke of the Piston downwards, so that the whole Series of Vessels, Viscera and Glands, with their contain'd Fluids, being in this Case subjected to a contrary Pressure and Direction from the elastick restitutive Force of the contractile Solids, in returning to their former Dimensions, from whence there will be produc'd a new Agitation, Oscillation, and Commotion of the Fluids, which will be render'd thereby better fitted for Circulation, Secretion, Nutrition, &c. Now upon each Stroke of the Forcer upwards, the Person will become affected with the like proportional similar Alterations, as he would be in the external Air or Atmosphere, upon its changing from being heaviest to lightest; with this Difference, that as in this Case, the Rarefaction of the Air is twenty Times greater, so the Alterations produc'd thereby in the Body will be also twenty Times greater, than what would have follow'd from a Change of the Atmosphere from heaviest, to lightest. This being done, we may now proceed to make another condensing and rarefying Stroke as at first, which may be repeated alternately and successively for any Time requir'd. Moreover the Air in the Receiver may be quickly and wholly renew'd and chang'd whenever the Person pleases, and be replac'd again with fresh Air, by setting open the Valve y, upon the Cover of the Receiver; or the Valve u, at Bottom of the Barrel; and if the Person

finds

finds any Inconvenience from Breathing with the Air in the Receiver, either from its being too much condens'd or rarefied by the several Strokes of the Forcer; or from the Steam and Vapours exhaling from his own Body, in such Case he may be supply'd with fresh Air for Breathing, by holding the End *r*, of a flexible membranous leather Pipe *r p*, in his Mouth, the other End whereof *p*, communicates with the external Air, the Construction, with the Manner of using which Suction or respiring Pipe having been already explain'd in the former Chapters, must for Brevity refer thereto.

6. Now with respect to this new mechanical Method of applying the Air for communicating Motion and Exercise to the humane Body, by causing it to operate with Strokes and Impulses of different Force and Pressure, alternately and successively apply'd and impress'd thereupon; the following material Points are farther to be remark'd; first then, the Person in the Receiver may be consider'd as plac'd within an artificial Atmosphere, which, like as the general Atmosphere wherein all animal Bodies, &c. are contained, is capable of having its Properties of Gravity, Elasticity, Pressure, &c. chang'd; but with this very considerable Difference, that this artificial Atmosphere admits of having those its Properties alter'd at Pleasure, and as often as wanted, and also continued under those Changes for any Time requir'd, and besides it admits of being chang'd with much greater Variety as to the Quantity and Degrees thereof: Now the Properties of this artificial Atmosphere as to its Gravity, Pressure, &c. become chang'd in any Degree and Proportion by the Motion and Strokes of the Forcer, as it moves upwards or downwards in the Barrel. Secondly, the Strokes made by the Forcer in descending; (which for Distinction I shall name the condensing Strokes) as also the ascending Strokes (which I shall call the rarefying Strokes) may be perform'd with all Degrees of Velocity, and with all Quantities of Pressure, and with any Interval or Space of Time between the Strokes, in such wise that the condensing and rarefying Strokes may be made to keep Time exactly with the Systole and Diastole of the respiring Organs, so that the whole Body being thus subjected to such universal Systoles and Diastoles, accompanied with such great additional Quantities of Pressure, capable of being thus laid on and taken off the Body successively, and that in all Degrees, with respect to the Quantity, Velocity, and Time, &c. the whole animal System both Solids and Fluids will become thereby thoroughly and most perfectly exercis'd, agitated, compress'd and dilated equally in all Parts, from the Circumference inwards to the Axis, and from the Center outwards to the Surface; as if it was manufactured in a Fulling-Mill, or squeez'd alternately in a Press, and this Machine for that Reason may not improperly be call'd a pneumattick Mill Press or Churn; or more properly an artificial Lungs, the Air being in this Case apply'd and made to operate upon the whole external Body by alternate Strokes, much after the Manner as it does upon the natural Lungs, in order to communicate Motion and Exercise to the whole Mass of Blood, as it circulates through the said Organ.

7. Although in the Case as was suppos'd in Number 5, foregoing, the Air in the Receiver was understood to be condens'd into half the Space and Volume of the common Air, by the Stroke of the Forcer in descending from *F 2*, to *F F*; in which Case the Air in the Receiver will have the same Pressure as that of a double Atmosphere, as being twice as dense, yet nevertheless the Strokes of the Forcer may be so regulated, as to condense and rarefy the Air alternately in the Receiver in any other Proportion, either greater or less; and thus if the Forcer, instead of rising up to *F 2*, rises only to one tenth, one fourth, or one half Part that Height, in which Cases the Condensation and Rarefaction of the Air in the Receiver, and the additional Pressure that will be alternately laid on, and taken off the Body, will be only one tenth, one fourth, or one half, &c. of what it was in the foregoing suppos'd Case, when the Forcer was suppos'd to make the Stroke from the Height *F 2*; and to render the Air in the Receiver twice as dense as common Air. Again, on the contrary, was it requir'd to lay any greater Pressure upon the Person in the Receiver than that of a double Atmosphere, as was suppos'd in the first Case; as suppose that of a Triple, Quadruple, Quintuple, &c. Atmosphere, for that Purpose, the Forcer must be rais'd up to the several different Heights within the Barrel mark'd *F 3*, *F 4*, *F 5*, &c. so that the Forcer in descending from those several Heights, will render the Air in the Receiver either three, four, or five Times denser than common Air, and so for all other intermediate Degrees of Condensation and Rarefaction, which may be thus varied in all the Degrees requir'd. And in order to know the Degrees of Condensation of the Air in the Receiver, and how far to regulate the Strokes of the Forcer, so as to produce the just Degree of Condensation and Rarefaction, as is judg'd will answer best to the Person's Case, and to fit the Machine to answer all Intentions of this Kind, for this Purpose there must be a mercurial Gage Tube *b b*, joyn'd to the Side of the Receiver, the lower End of which Tube is immerg'd into a Vessel with Mercury *e e e e*, which communicates with the Receiver *r r r r*, by means of the Pipe *g 6*, upon the upper Surface of the Mercury there may be put some Water to the Height mark'd *ww*, to keep the Mercury from any wise affecting the Air in the Receiver, &c.

8. This Method of producing such universal Systoles and Diastoles throughout the whole animal System, in such wise that the said Motion of contracting and dilating, shall be produc'd with all assignable Quantities of Weight, Force and Pressure, as also with all Degrees in respect to the Velocity of the Strokes, and likewise with respect to the Time between the Strokes, which may

be perform'd with any Degree of Celerity, and with any Interval of Time between, in such wise that each Stroke as well the condensing as the rarefying one, may be produc'd either in the Space of one, two, three, four, five, &c. Seconds of Time; or only once in the Space of one, two, three, four, five, &c. Minutes; by which Means those Strokes may be made to keep Time with the Systole and Diastole of the Heart and Arteries, or with the alternate Motion of the Lungs. So that by this mechanical Method of applying the Air, the whole animal Machine may be submitted to a Motion of universal Systoles and Diastoles, and if requir'd may be made to conspire and operate at the same Time as the Heart and Lungs undergo the like alternate Motions; or with any other Interval between the Strokes requir'd, and as is judg'd will answer best for attaining the Intentions of Cure propos'd thereby. So that this Method of Exercise is universal, as it may be apply'd with all possible Degrees of Force, Pressure, Celerity, Time, &c. and that to all Persons, old or young, weak or strong; or let their Case, Condition and Constitution be what it will, upon which Accounts this will become the most perfect of all Exercises, inasmuch as Motion will become hereby communicated to the animal Solids and Fluids in the most efficacious equable perfect Manner, as the Motion is impress'd upon the Body by the elastick Fluid the Air, apply'd thereto by alternate successive Impulses and Strokes, whereby the Solids will be made to vibrate with great Force upon the Fluids, which will become thereby attenuated and propell'd by a strong additional impulsive Force, in the same Manner as they are by the alternate Systoles and Diastoles of the Lungs, Heart, and arterial System; whereas in all other Kinds of Exercise, either Walking, Riding, Dancing, Fencing, Bathing, Vomiting, Purging, Sweating, Salivating, Blistering, &c. the Motion is communicated and distributed unequally to the Solids and Fluids, which become thereby only put into certain irregular Motions, Agitations, Concussions, with various contrary Directions, whereupon must follow unequal Derivations and Revulsions of the Fluids. Moreover Persons old or infirm can't take the Benefit of any of the above Exercises, as being too laborious and fatiguing; but this new and most perfect Exercise, all Persons may receive the Benefit thereof, inasmuch as it requires no bodily Labour nor Fatigue to attain the same; for according to this Method a Person, tho' sitting still, yet nevertheless the whole System of his Solids and Fluids become exercis'd all the while in the most natural perfect Manner, without his using or employing any Effort with his Body for that Purpose, and that only by this Method of applying the Air thereto, so that the Old and Young, the Weak and Strong, the Healthy and Diseased, may all alike equally receive the Benefit of this most efficacious healthful Exercise, even when their Case and Condition will not allow them the Benefit of any other Exercise whatever.

9. I shall here once for all offer one general explanatory Note relating to the Draughts now refer'd to, with those relating to the other Parts of this Essay; that in the little Images, Pictures and Sections of the humane Body, in this, and all other the like Draughts, I have represented the Outlines, Boundaries and Surface of the Body by two parallel Lines, the outermost whereof is one real continued Line, but the innermost is a prick'd or discontinued Line, which two parallel Lines are intended to represent the different Effects produc'd in the Body, when submitted to the Discipline and Exercise either of this pneumatick Machine, or any of the other mechanical Methods describ'd in the other Chapters; thus upon every condensing Stroke of the Forcer, the Body will become reduc'd to less Bulk and Dimensions every Way, and as such may at every condensing Stroke be represented by the innermost prick'd Line; but at every rarefying Stroke the Body will thereupon evolve and dilate to its first uncompress'd State and Dimensions, so this contrary Effect produc'd in the Body by each rarefying Stroke, may be aptly enough express'd by the outermost real Line; so that the humane Body, when submitted to the Exercise and Discipline of this pneumatick Mill or artificial Atmosphere, may be conceiv'd as kept alternately contracting and expanding, or subjected to an alternate universal Pulsation, or Motion of Systole and Diastole; like as the Heart, Lungs, and Arteries; the Space between the outermost real Line and the inner prick'd Line, serving to express the Quantity of that Contraction and Dilation, or the alternate Vibrations which the Body will undergo, whilst under the Discipline and Exercise of this Machine or artificial Atmosphere.

10. Now that this Method of applying the Air to the humane Body is the most natural, perfect, healthful Way of exercising and communicating Motion thereto, is manifest from the very like Methods which Nature takes for the continual Exercise and Preservation of the Life and Health of Animals and Vegetables; through all the several progressive States of their Existence: Now this great End we find to be effected two principal Ways; the first is by causing our Bodies to be surrounded with a heavy elastick Fluid Medium, the Atmosphere, by the continual Changes whereof as to its Gravity, Heat, &c. the Bodies of Animals and Vegetables are kept in a constant State of Exercise, and have a Motion of Systole and Diastole continually impress'd thereupon, being ever either contracting or expanding in respect to their Dimensions. The second general Way whereby Nature communicates Motion and Exercise to animal Bodies, is also perform'd by the same variable elastick Fluid the Atmosphere, only differently apply'd, and made for to operate by alternate Strokes and Pressure upon the animal Fluids, by means of the peculiar Organization and Mechanism of the Lungs, or of some other Organ analagous thereto; whereby the Blood receives the Benefit of the most perfect healthful Exercise, and is thereby kept in a fit State for
the

the several Uses of the Animal Œconomy. Now those are the two general principal Methods instituted by the Author of Nature, for preserving the Life and Health of Animals, and both Methods consist wholly in the mechanical Effects of the Air differently apply'd to the Body; now as the new Method of Exercise here described is grounded on the very same Principles, and perform'd by a like mechanical Application of the very same Elastick Fluid, the Air; it follows demonstratively, (allowing Nature's Laws and Institutions as the truest Original to copy after) that this must be the most perfect, universal and healthful of all Kinds of Exercise, both for preserving Health, and recovering it when lost.

11. Moreover, this new mechanical Method of communicating Motion and Exercise to the Human Body, by means of the Air, will serve not only as the most perfect of all Kinds of Exercise for preserving Health, but will prove, when prudently apply'd, one of the most efficacious universal Remedies in Nature for the Cure of Diseases; and this Method, together with the others described in this Essay, assisted with proper Aliment, will serve to effect all the Changes and Alterations that are necessary towards the Cure of all Diseases, either of the Solids or Fluids, and whether they retain to the acute, or chronical Kind, &c.

12. Bathing, cold or hot, is justly esteem'd as one of the best Exercises and Remedies for preserving Health, and the Cure of Diseases; forasmuch as it is found by Experience (which is ever the best Rule to go by) to succeed in the Cure of many Diseases, that have been in vain attempted by all the most famed pompous Medicines and Specificks so much in common Vogue and Practice. Yet notwithstanding this just Praise and Encomium of the Bath, this new Method of exercising the Body with this Pneumatick Engine or artificial Atmosphere, will prove of much greater and more universal Efficacy for the Cure of Diseases, than either the cold or hot Baths; as will more fully appear from considering the following Points: First, The chief Virtue and Efficacy of the Bath consists in its Gravity and Pressure, which (in the common Practice of Bathing as now in Use) is always of one certain limited Quantity, like to a Medicine given always in one invariable Dose, let the Person's Case be what it will; but in the Practice of this new Method, the Body may be submitted to any Degree of Pressure from the Air, exactly suited to the Strength and Constitution of the Patient, and as the Symptoms and Indications may require: Moreover, in the common Method of Bathing, let a Person place his Body in the Water how he will, yet still the Pressure will be laid unequally upon his Body, which will always be accompany'd with an irregular Determination and Distribution of the Fluids; but in this new Method of Exercise the Pressure will become laid on and taken off all Parts of the Body equally, as being communicated by the Elastick Fluid the Air. Moreover, the Pressure which a Person sustains upon being immerg'd in Water, operates upon his Body only as a dead unactive Weight, whereas the Pressure which the Body receives from the Air, being thus made to act upon the same by alternate successive Strokes and Impulses, of different Quantities and Forces, is to be consider'd as a continual active Pressure and Principle of Motion and Exercise; for in every Stroke made by the Forcer, either for condensing or rarefying the Air in the Receiver, the Quantity of Pressure upon the Person's Body is continually varying from less, to greater, and the contrary; whereby the whole Body is kept in a constant Oscillatory Motion and Fluxionary State: And thus from the Instant of Time that the Forcer begins to make the condensing Stroke until it is finish'd, or arrives at the lowermost Situation FF, the Pressure upon the Person is all that Time gradually increasing; and again, all the Time that the Forcer is making the rarefying Stroke, until it is finish'd, the Pressure of the Air upon the Person's Body is gradually diminishing; so that the Pressure, thus apply'd to the Body, operates thereon with a constant variable active impelling Force, whereby the whole Body is kept in a vibrating Motion; and not as a dead unactive Pressure, as is the Case of the Bath, both cold and hot, so far as relates to the Property of Weight and Pressure, and abstracting from its Stimulus.

13. To demonstrate farther what great and mighty Changes may be produc'd in the animal Machine, by this new mechanical Method of applying such an active variable Quantity of Pressure thereto, by means of the Elastick compressible Fluid the Air, it will be sufficient for this Purpose, if we consider the wonderful Effects which the very same Fluid has upon the Blood, by the joint Mediation and Operation of the Lungs, which are a perfect Pneumatico-Hydraulic Engine: This Subject has been already consider'd in the third Chapter; however, as it serves strongly to prove the Truth, Necessity, and Benefit of this new Method of exercising the Human Body, I shall here again briefly resume the Consideration of that Subject, that the Comparison between both Methods may appear the stronger. The Blood then returning from all Parts of the Body by the Branches of the Vena Cava to the Heart, having lost many Parts by Secretion, Nutrition, &c. and in moving through the diverging System of the Arteries, and being divested of great Part of the Lympha, is render'd thereby viscid, poor, and effete, upon its Arrival at the Heart, where mixing with the Chyle and Lympha constantly flowing in from the thoracick Duct, after passing the Right Auricle, are together receiv'd into the Right Ventricle of the Heart, by which it is projected and thrown into the pulmonary Artery, by the Ramifications whereof the Blood becomes diffused throughout the whole internal vesicular Substance of the Lungs, which becoming fully inflated by the Descent and Intrusion of the Air thereinto, in the Act of Inspiration, the pulmonick Vessels being now freed from Resistance, have their Diameter enlarg'd and fill'd with

Blood; which Air again, as it comes to be ejected, in the Act of Expiration, by its Pressure upon the Blood Vessels, serves to grind, analyze, assimilate, and combine the Blood, Chyle and Lympha, &c. together; and thus by those alternate successive Strokes, or Systoles and Diastoles of the Lungs and Air, assisted by the like alternate Strokes of the Heart, and arterial System, the Blood is kept perfectly mix'd, so as to constitute an uniform, smooth, Balsamick Fluid, fitted for all the Offices of Life. Now the very same Air, as apply'd outwardly to the Body by this new Pneumatick Machine or artificial Atmosphere, produces an Effect upon the whole external Body, and by Consent upon the internal Blood Vessels, in a Manner exactly analogous to what it does upon the Blood Vessels in the Lungs; for as the Air, by being alternately injected and ejected into and out of the Lungs, serves by its active Pressure and successive Strokes for to communicate Motion and Exercise to the Blood; even so in like Manner, the Air in the Receiver being alternately condens'd and rarefy'd, by this new Pneumatick Engine, and being directed and made to operate with all Degrees of Pressure upon the Person's Body in the Receiver: Thus whilst the Forcer is making the condensing Stroke, (which may be conceiv'd as relative and analogous to the Act of Expiration, as perform'd by the Lungs) the Body being laid under an equably and uniformly decreasing Pressure, the whole vascular System will become subject to an universal Systole or Contraction, beginning from the external Surface of the Body, and propagated inwards to the central Parts or Axis of the Body: And again, during the Time that the rarefying Stroke is performing, (which may be conceiv'd as similar and analogous with the Act of Inspiration of the Lungs) the Body will be laid under an equably and uniformly decreasing Pressure; whereupon the whole Elastick vascular System, by its intrinsic restitutive Force and Spring, will evolve and unfold; and undergoing an universal Diastole and Expansion in all its Parts, from the Axis or Center, to the Surface of the Body, will have its Dimensions enlarg'd; and thus the Body will continue to be thus affected with an alternate Motion of contracting and expanding, so long as it is subject to the Discipline and Exercise of this new Pneumatick Engine, which is exactly similar and analogous to the Operation of the Lungs, or a Pair of Bellows. So that the Person in the Receiver, by having the Air condens'd and rarefy'd alternately about his Body, may be conceived to receive the like Effect therefrom, as if his Body was provided with two universal Muscles; the one drawing his whole Body with a Direction tending from the external Surface of the Body, towards its Axis; whilst the other Antagonist Muscle in its Turn draws all Parts of the Body with a Direction tending from the Axis of the Body, outward, to its external Surface; the Air when condens'd in the Receiver, performing the like Effect and Office with the first of those two imaginary Muscles; and the Air, when rarefy'd in the Receiver, produces a similar Effect with the other Antagonist Muscle: And thus the whole Animal Machine being thus subjected to a variable Quantity of Pressure, increasing and decreasing equably and uniformly, will become thereby most perfectly exercis'd in all its Parts, like as the Blood is by the alternate Operation of the Lungs; or like as a Piece of Cloth is manufactur'd in a Fulling-Mill, by which universal Oscillations, Contractions and Expansions of the Solids and Fluids, the same will become perfectly well adapted for subduing the Viscidity and cohesive State of the Fluids, and fitting them for passing the several Glandular Strainers, as also for curing Obstructions, Tumors, Atrophies, Consumptions, Dropsies, Cachexies, Agues, Fevers, &c. And as the Fluids will have their Crasis, Texture, and Temperament perfectly repair'd, mended, and improv'd, by the Discipline and Exercise of this new Pneumatick Machine or artificial Atmosphere; so in like Manner the Animal Solids will receive an equal Benefit thereby; for by the quick, strong, alternate Contractions and Dilatations which the Solids will undergo by this new Exercise, such Parts as are no longer fit to be retain'd in the Texture and Composition of the Solids, as being either worn out, or being in their own Nature heterogeneous and unassimulable with the Structure of the Animal Fibres and Solids, will become thereupon loosen'd, separated, and cast out, and thereby Room made for the Introduction and Attraction of other Particles more homogeneous and approaching to the Principles and Composition of the Animal Fibres, which is what constitutes the Idea and Process of a sound perfect Nutrition or Reparation of the Solids.

14. Now to render this Machine and Method of Exercise still more universal, and at once to answer all Intentions that can be obtained thereby; for that Purpose there is added to the Machine a small Vessel or Copper *v v v v*, which communicates with the Receiver *R R R R*, and Barrel *B B B B*, by the Pipe *v f*, (*Vide* Fig. 7. Plate 2.) the Use of this Vessel is to produce Vapours or Effluvia, either humid or dry, which may be produc'd from Substances of all Kinds, Solids or Fluids, that have any medicinal Qualities; with the Vapours or Effluvia raised from any such Materials, it is propos'd the Air in the Receiver may be impregnated in all Degrees and Proportions, as there is occasion to answer any particular Case, Symptom and Indication; which Air thus artificially prepar'd and medicated, may prove of much greater Efficacy in some particular Cases, than in using common simple Air alone. What relates farther to the general curative Intentions that may be derived from this Method of Fumigating the Body, either with humid or dry Vaporation, may be collected from what has been said in the foregoing Chapters, in other the like Cases, &c.

15. By the vertical Section, Fig. 8. Plate 2. the same Pneumatick Machine, with that describ'd in the foregoing Numbers, is again represented, with this Difference only, that the Person

in this latter Case is shewn receiving the Discipline and Exercise of the Machine in a standing Posture within the Receiver, whereas in the former Case he was represented sitting therein, &c.

16. In Fig. 8. Plate 2, there is shewn another Disposition and Application of the aforesaid pneumattick Engine, which is after the following Manner; thus *B B B B* is the Barrel, joyn'd to the Receiver *R R R R*, within which, and down towards its Bottom is fix'd a transverse Piece *q q*, upon which the Person is represented standing upright, the lower Part of the Barrel and Receiver being fill'd with Water, cold or hot, as the Case requires the upper Surface of the Water in the Receiver and Barrel being at the prick'd Line *w 1*, when the Forcer *F F* is at its lowest Situation in the Barrel, the upper Level of the Water in the Receiver will be at *w 1*, and all the Space from the Surface of the Water to the Top of the Receiver is fill'd with Air, upon the Cover *R R* of the Receiver is a Valve or sliding Plate *y*, made to open and shut by a small Spring, to let the Air into or out of the Receiver as there is Occasion; upon the Bottom of the Barrel is ingrafted a Pipe *u p v*, one End whereof opens into the Barrel and has a Valve *u* fitted thereto within side of the Barrel, and opens upwards and inwards; the other End of this Pipe communicates with a Vessel or Copper *v v v v*, fill'd with Water, cold or hot; so that upon raising the Forcer *F F*, to any Height in the Barrel, as *F 2*, *F 3*, *F 4*, *F 5*, &c. the Water will come in from the Vessel *v v v v*, and pushing open the Valve *u*, will fill all that Part of the Barrel underneath the Forcer, so that let the Forcer be rais'd to what Height soever in the Barrel, the Water will rise along with it close to its Underside, and upon pushing the Forcer downwards, the Water endeavouring to return the same Way it came in, will cause the Valve *u* to shut, whereupon it will become all push'd and forc'd into the Receiver, and will rise up to different Heights therein, in proportion to the Heights from which the Forcer descends in the Barrel. Thus if the Forcer be rais'd up to the prick'd Line *F 2*, and from thence descends or makes a Stroke to *F F*, in that Case the Water may be made to rise in the Receiver from the prick'd Line or Level *w 1*, to the Height or Level *w 2*, so as just to cover the Top of the Person's Head; suppose again that the Forcer is rais'd up to the several Heights *F 3*, *F 4*, *F 5*, &c. upon pushing the same down from those respective Heights, until it comes to the lowermost Position *F F*, the Water in the Receiver will be rais'd to the several corresponding proportional Heights *w 3*, *w 4*, *w 5*, &c. Now as the Water in the Receiver is rais'd above the Level *w 1*, to the other several Levels and Heights *w 2*, *w 3*, *w 4*, *w 5*, &c. the Air in the upper Part of the Receiver will be condens'd proportionally. In this Draught there is nothing shewn but the Barrel and Receiver, all the Timber Frame serving to fix and sustain the same, with the Apparatus and Machinry serving to work the Engine being left out; all which with what farther relates to the understanding this Draught, may be collected by referring to the former Draughts and Numbers where the same have been described.

17. All Things being thus dispos'd in the Manner before explain'd, now in order to apprehend rightly the Operation, Effects and Use of this Machine, let the Person be plac'd standing upright with his Body naked in the Receiver, the upper Surface of the Water being at *w 1*, underneath the transverse Piece *q q* upon which he stands, and let all the Space between the Surface of the Water, and Cover *R R* of the Receiver, be fill'd with common Air, the Forcer *F F* being now at the lowest Situation in the Barrel; which being suppos'd, let the Forcer be rais'd up, suppose to the Height *F 2*, whereupon the vacant Space produc'd in the lower Part within the Barrel, by the rising up of the Forcer, will become fill'd with Water from the Copper *v v v v*, by the Pipe *v p u*; let now the Forcer make a Stroke by descending from *F 2* to *F F*, whereupon the Water underneath the Forcer will be all thrown into the Receiver, so that the Level of the Water which before stood at *w 1*, will become rais'd by this Stroke to the Level or Height *w 2*, so as just to cover the Crown of the Person's Head, and the Air in the upper Part of the Receiver above the Water, will be condens'd into half the Space it took up before, whereby an additional Pressure of about 40,000 Pounds Weight will be laid upon the Person's Body, for as the Air in the Receiver is suppos'd by this Stroke of the Forcer, to be render'd twice as dense as common Air, the same will press upon the Surface of the Water now at *w 2*, with the same Weight and Pressure as a Column of Water about seventy perpendicular Feet, and having the Area of the Water at *w 2* for its Base, so that the Person's Body in the Receiver, though but just barely covered with the Water, will nevertheless sustain as great a Pressure therefrom as if he was immerg'd to the Depth of 35 Feet under Water, and expos'd only to the external Air; by which additional Pressure the Person's Body will undergo an universal Systole or Contraction of all its Dimensions, from the external Surface inwards to its Axis; the Quantity of which Contraction may be represented by the prick'd Line, serving to mark the Contour or Boundaries of the humane Body, as express'd by the little Picture or Image in the Draught. Having shewn what Effects will be produc'd by the condensing Stroke, I shall next consider how the Person's Body will be influenc'd and affected upon making the rarifying Stroke, or raising the Forcer up until it comes to the same Height *F 2*, from whence it descended; upon doing which the following Phænomena and Effects will be produc'd; the Air in the Receiver that was condens'd by the preceding Stroke into the Space *R R w 2*, will now become expanded into the Space *n n w 1*, which being suppos'd twice as big as the other Space into which it was condens'd, consequently the Air will be render'd twice as rare, and the Person's Body that was but just before submitted to an additional Pressure of 40,000 Pounds, or that of a double Atmosphere; or as if he was immerg'd thirty-five Feet under Water in the open
Air,

Air, will now have that whole additional Pressure entirely taken off his Body, which will thereupon by the restitutive Force and Refort of the Solids be made for to undergo a general Diastole or Expansion, from the Center outwards to the Surface of the Body, which will thereupon have its Dimensions every where enlarg'd; which increas'd State or Dimensions of his Body may be express'd by the outermost real Line, in the little Image or Picture of the humane Body in the Draught; and the Space between the outer real Line and the inner prick'd Line parallel thereto, (which serve to determine the Contour or Limits of the Body) shews the Quantity of the Contraction and Dilatation which the Body will be made to undergo alternately and successively by each condensing and rarifying Stroke of the Forcer. Suppose now again the Forcer to be rais'd to the several respective Heights marked F 2, F 3, F 4, F 5, &c. and to make a Stroke by descending from any of those several Heights, until it comes to the lowest Situation F F, upon doing which the Water will be rais'd in the Receiver to the several corresponding proportional Heights, w 2, w 3, w 4, w 5, &c. and the Air in the upper Part of the Receiver be render'd two, three, four, five, &c. Times denser than common Air; whereby the Person in the Receiver may have an additional Pressure alternately laid on, and taken off his Body, equal to that of a double, triple, quadruple, quintuple, &c. Atmosphere; or as if he was immerg'd to the Depth of 35, 70, 105, 140, &c. Feet under Water in the open external Air. And after this Manner the condensing and rarifying Strokes may be made with all Degrees of Force and Pressure requir'd, by raising the Forcer higher or lower, or by making the Strokes longer or shorter, so that the Person may not only be subjected to the Pressure of a double, triple, &c. Atmosphere, but to all the intermediate Degrees of Pressure between that of a double or triple, &c. Atmosphere. And the Strokes both for condensing and rarifying the Air may be made with all Degrees of Celerity, and with any Space of Time between the Strokes, as has been explain'd in the preceding Numbers, all the Difference being, that in the former Draughts of this Machine, the Air alone was the Medium and Instrument made use of for communicating Motion, Exercise and Pressure to the Body, but in this Draught of the Machine the Person has this Motion, Exercise and Pressure communicated and alternately impress'd upon his Body by means of Air and Water together. And moreover the Water may be made to rise to different Heights about his Body, either as high up as his Neck, Breast, Loins, &c. just as the Case and Intention indicates; and when the Person's Body is not wholly immerg'd, but only in part in the Water, yet still that Part that is only press'd upon by the Air, will be very differently affected to what it would be in the common Practice of Bathing; for as the Air in the Receiver is condens'd, the Case will be different between a Person's standing in the Water up to his Neck in the Receiver, to what it would be upon his standing with the Water to the same Height about his Body in the external Air. Moreover by having the Copper v v v v made to communicate with the Barrel, and Receiver by the Pipe v p, the Receiver may be supplied either with cold or hot Water in all Degrees; as also with Vapours or Effluvia either humid or dry, with which the Air in the Receiver may be variously impregnated and medicated in all Degrees, as may best contribute to promote the several Intentions, as has been more particularly explain'd in the foregoing Chapters.

18. This new mechanical Method of exercising or communicating Motion to the humane Body, by laying on an additional variable Pressure of any assign'd Quantity thereupon, and taking the same off again alternately, by means of Air and Water jointly together, will be found of extraordinary Efficacy and Benefit, and will prove more successful in some particular Cases, than performing the same Effects and Intentions with Air alone; and particularly in the Case and Cure of the Bite of a mad Dog, or any other Animal, with its last and most fatal Period and Symptom the Hydrophobia; for in this particular Case by using of Water together with the Air, there will be this singular Advantage obtain'd, over and above the Effects produc'd from Pressure alone, and that is the Effect caus'd and resulting from a twofold Stimulus, one whereof is produc'd from the Coldness of the Water, which every Time it is rais'd up by the condensing Stroke about the Person's Body, must cause a disagreeable Stimulus or uneasy Sensation, which together with the additional Pressure, will produce a proportionally greater Contraction of all Parts of the Body from the Surface inwards to the Center, than what it would have been from the Pressure alone without the joint Action of the Stimulus; and again every Time the Water is taken off the Person's Body, (as it will upon every rarifying Stroke) there will be a proportionally greater Expansion produc'd of all the Parts from the Center outwards to the Surface of the Body, not only from the additional Pressure being taken off the Body, but from the Stimulation caus'd by the Coldness of the Water, being also taken away at the same Time. And there is moreover in this Case another Stimulus obtain'd from this Method of applying the Machine, and that is by causing both the condensing and rarifying Strokes to be made to follow each other quickly, and with great Celerity, Pressure and Force, whereby the Person may be laid all under Water unexpectedly and of a sudden, the Water being made to rise over his whole Body in an Instant of Time before that he is aware, now this sudden unexpected Immersion, attended with great Pressure, will produce a Surprise, which will likewise operate as a Stimulus, which being join'd to the other Stimulus arising from the Coldness of the Water, together with the great additional Pressure; all which three distinct Causes co-operating jointly together, with one Tendency and Direction, will produce still a greater Contraction of all Parts of the Body from the Surface inwards to its Axis, than what the two first

Causes alone would have done; and again upon the contrary, upon taking the same off the Body, it will undergo a proportional greater Expansion from the Axis outwards to the Surface. Now as both the condensing and rarefying Strokes may be made with all Degrees of Pressure and Velocity, in such wise that the Person may be subjected to as great an additional Pressure as if he was immerg'd to the Depth of one, two, three, four or five hundred Feet or more under Water, and that laid on, and taken off his Body alternately, and in an Instant of Time, so that by the quick Repetition of those Strokes, accompany'd with such Force and Pressure, together with the Operation of a twofold Stimulus, thus alternately, quickly, and successively apply'd to the Body, the same will become thereby thoroughly and most perfectly exercised in all its Parts both Solids and Fluids, and by the great Quantity of Motion thus impress'd upon the Solids, the same will be thereby enabled to subdue the animal Poison, and expel the same out of the Body; upon all which Accounts this Method manifestly appears for to afford the most natural, efficacious, rational Principles, for the Cure of this most terrible Distemper, with all others retaining to the like rebellious Race and Disposition.

19. By the Draught and vertical Section, Fig. 4. with the horizontal Section and Plan, Fig. 5. agreeing therewith, in Plate 2, another Method is proposed for Constructing the Barrel *B B B B*, with the Apparatus and Machinery, for Condensing the Air in the Receiver *R R R R*, which is after this Manner; *B B B B* is a cylindrical Barrel of Cast Iron or Brass, from three to five or six Feet in the Bore, and from one to three or four Feet in Height, which must be bored within-side; upon each End of the Barrel is a broad Flanch, to which there is fixed with Screws a metallick Plate, one at Top, and the other at Bottom, so as to render the Barrel, Water and Air tight; *A A* is an Axis of cast or hammer'd Iron, to the Middle whereof, and Lengthwise of the Axis, is fix'd a broad Plate *F F*, (which I shall name the Forcer) the outer Edge of this Forcer, as the Axis *A A* turns round within the Barrel, must move close to the Side of the Barrel, and to make it fit and move the truer and closer, the Forcer may be arm'd with Leathers upon both Sides; *z x* is a Plate fix'd vertically in the Barrel, one Edge whereof *z*, is fix'd into a Channel or Groove form'd upon the Inside of the Barrel, and its inner Edge *x* joins close to the Side of the Axis *A A*, all that Part of the Axis within the Barrel, between the top and bottom Plates, is turn'd to a true Cylinder; *R R R R*, is the Receiver with the Person standing upright therein, which Receiver is joyn'd to the Barrel by means of a Flanch with Screws, in like Manner as in the other Draughts of this Machine before described; upon the Cover *R R* of the Receiver is folder'd a Pipe *y y*, with two Cocks thereto, one within-side, and the other without-side, which the Person may open or shut to let the Air into, or out of the Receiver, as he finds Occasion; the Barrel *B B B B*, communicates with the Copper *v v v v* by a Pipe *v p u*, by which it is kept supply'd with Water, cold or hot, in all Degrees, as also with Steam or Vapours to be apply'd, as the Person's Case and Symptoms indicate: That Space within the Barrel between the Forcer and Receiver is always fill'd with Water, &c. suppose now the Forcer *F F*, to be in the Position as is shewn by the prick'd Line *F 2*, (*Vide* Plan, Fig. 5.) and let the upper Surface of the Water in the Receiver be at *w 1*, (*Vide* Section, Fig. 4.) if now the Axis *A A*, and Forcer *F F*, be made to turn round in the Barrel from the Position *F 2*, until it comes into the Position *F 1*, just to the Side of the Orifice, where the Barrel and Receiver communicate, which is the utmost Bounds beyond which the Forcer never moves, so that when the Forcer moves with a circular Motion from the Situation *F 2*, to the Situation *F 1*, it will force and discharge all the Water contain'd in that triangular cylindrical Segment *F 1 2 F*, into the Receiver, whereby the Water will become rais'd therein from the Level *w 1*, to *w 2*, so as just to cover the Crown of the Person's Head, and the Air in the upper Part of the Receiver be condens'd into half the Space which it occupy'd before, whereupon the Person will have an additional Pressure laid upon him equal to about 40,000 Pounds. And again, upon causing the Axis and Forcer to move with an angular revers'd Motion the contrary Way, from the Situation *F 1*, until it comes into the Situation *F 2*, from which it last mov'd, upon doing which the following Phænomena and Effects will present; the compressing Force being now remov'd, the condens'd Air at Top of the Receiver upon dilating and unfolding its Spring will push the Water down from the Level *w 2*, to *w 1*, underneath the transverse Piece *q q*, upon which the Person stands, and the Person's Body that was just the Instant before all cover'd with Water, will now be only encompass'd round with Air of the same Density with the external Air, and his Body that was but just before subjected to an additional Pressure of about 40,000 Pounds Weight, will now have the same entirely taken off; and by repeating the like condensing and rarefying Strokes, by causing the Forcer to move alternately with a circular revers'd Motion, from the Situation *F 2*, to *F 1*, and back again; the same additional Quantity of Pressure may be laid on, and taken off the Body alternately for any Time requir'd; and the Strokes may be perform'd with all Degrees of Velocity, and with any Interval of Time between the Strokes; as has been shewn in the former Numbers. Now if it was requir'd to have a greater additional Pressure laid upon the Body, as suppose that of a triple, quadruple, &c. Atmosphere; in that Case the Axis with the Forcer *F F*, must begin to produce the condensing and rarefying Strokes, by moving from the several Divisions and Stations within the Barrel, mark'd, *F 2*, *F 3*, *F 4*, *F 5*, *F 6*, &c. Thus, for Example, if the Forcer begins for to move or make the Stroke from *F 3*, to *F 1*, the Water in the Receiver will become push'd up from the Level *w 1*

to w_3 , and the Air above the Water be render'd three Times as dense as common Air, whereby the Person will be subjected to a Pressure equal to that of a triple Atmosphere. If the Forcer begins to make the Stroke by moving between F_4 , and F_1 , the Water will be rais'd up from the Level w_1 , to w_4 , and the Air become condens'd into four times less Space than common Air, whereby the Person will be placed under a Pressure equal to that of a quadruple Atmosphere. And if the Forcer be made to move from F_5 , to F_1 , the Water in the Receiver will be rais'd from w_1 , to w_5 , when the Air will be render'd five times denser than common Air, and the Person laid under a Pressure equal to that of a quintuple Atmosphere; and so for all other Distances, so that according to the Lengths of the Strokes, the Air will be condens'd and rarefied proportionally, and that in all Degrees and Quantities, as may serve best to advance and promote the Intentions of Cure propos'd thereby; and in order to know how to regulate and adjust the Machine, so as to lay on the just Quantity of Pressure intended, the same is for this Purpose provided with a mercurial Gage Tube bb , the Use whereof has been explain'd before. The pneumatick Engine, as here represented, may be work'd by the Force of Men, &c. for which Purpose there is fix'd upon the upper End of the Axis AA , a Wheel ww with a square Groove round its Circumference, wherein are fix'd the Ends of several Ropes w_1, w_2, w_3, w_4 , &c. to each whereof may be apply'd any Number of Men requir'd; and in pulling the said Ropes, the Men may do it either standing or sitting with their Bodies reclin'd backwards, according to which Method there may be any Number of Men apply'd for working the Machine, to the Number of a Thousand. As to what relates to the Structure of the Barrel and Forcer, with the Method of applying the common auxiliary Powers thereto, having given a particular Description thereof, with divers other new Machines, in another Treatise relating to Hydraulicks, must refer thereto for Brevity.

20. In the foregoing Draughts and Description of this Machine or artificial Atmosphere, the same has been consider'd only as apply'd to the whole Body, which was understood to be entirely inclosed in the Receiver, I shall next shew how the mechanical Effects of the same pneumatick Machine may be also apply'd to any particular Region or Member of the Body, as suppose it to be either a Leg, Arm, &c. after what Manner this may be effected may be readily understood by referring to the two vertical Sections of the Machine, Fig. 3. and Fig. 6. in Plate 2. In the first Figure a Person is represented with his Thigh, Leg and Foot, inclosed within a proper Vessel or Receiver $RRRR$, being thrust through a round Hole in the Plate or Cover RR fix'd upon one End of the Receiver, which Hole may be arm'd with soft Leathers to keep the Person's Thigh from being hurt by the Edge of the Hole, and likewise to secure and keep the Hole close stop'd, so that no Air, Water, or Steam may pass out between the Member, and the Edge of the Orifice. The Person thus sitting or standing with his Body in the open Air, and his Thigh and Leg within the pneumatick Mill, upon setting the Machine to work, the Strokes with the Forcer may be made so strong and quick, and with such a Quantity of Pressure, that the Member will become as thoroughly work'd and exercis'd, like as a Piece of Cloth is manufactur'd in a Fulling Mill: $vvvv$ is the Boyler or Copper for producing Vapours or Effluvia from Substances of all Kinds that are endow'd with any medicinal sanative Qualities for answering curative Intentions, with which Exhalations and Effluvia the Air in the Receiver may be kept impregnated to all Degrees of Strength requir'd; the Air in the Receiver being thus properly prepar'd and medicated with the Steam and Vapours produc'd from Ingredients well chosen and suited to the Intentions of Cure, will prove very successful in many obstinate Distempers, such as Tumors, Ulcers, either of the Inflammatory, Œdematous, Scorbutick, Strumous, Scrophulous, Dropical, Venereal Kind, &c. by reason of the strong, quick, frequent Vibrations, Tremors, Pulsations, and Stimulation that will become alternately and successively, and for any Time requir'd, excited, kept up and maintain'd in the Member by the alternate repeated Strokes of the Machine, whereby the oppress'd, languid, tonick Motion of the Solids will become restor'd, and the viscid, fizy, corrupt, stagnant Humours broken, attenuated and dissolv'd, and thereby fitted either for Suppuration, or to be thrown out by Transpiration, or resumed into the Vessels in the Course of Circulation, &c.

21. By the other Section and Draught, Fig. 6. of Plate 2. which presents a posterior View of a Person sitting with his Body in the open Air or Atmosphere, and having his whole Arm inclosed in the artificial Atmosphere within the Receiver $RRRR$; the Member being thrust in through a Hole in the Plate or Cover RR , fix'd upon the End of the Receiver, which Hole must be guarded round with soft Cloths or Leather, to defend the Arm from being incommoded, and to secure the Junctures, so as to let no Air pass out or in between the Person's Arm and the Edge of the Hole. What farther relates to the Construction, Use and Application of this Draught of the Machine, may be deduced by referring to the preceeding Numbers.

22. Now in what Manner the other Parts and Regions of the Body may be made to receive the Benefit of this most salutary Method of Exercise, may be readily understood from what has been said: Thus suppose that either the upper Region of the Body from the Loins upwards, was requir'd to be submitted to this new mechanical Exercise and Discipline; or the lower Region from the Loins downwards. How the former of those two Cases may be executed may be readily conceiv'd, (without the Necessity of having particular Draughts for that Purpose) making proper Allowances, by referring to the Draught, Fig. 6. Plate 1. by conceiving the Vessel $BBBB$, to be in this Case the Receiver, none of the other Parts of the Machine being here represented.

And as to the Manner how the second Case is to be effected, the same may also with proper Allowances be understood by the other Draught and Section, Fig. 7. in Plate 1. wherein B B B B represents the Receiver with the lower Region of the Body inclos'd therein; no other Parts of the Machine being exhibited in this Draught, it being originally design'd for another Purpose, and is only here referr'd to, to avoid multiplying the Draughts, &c.

23. That the new Mechanical Methods describ'd in this Chapter, for Preserving Health, and the Cure of Diseases, are founded upon just, true, and rational Principles, and must be accompany'd with all the salutary Effects that have been ascrib'd thereto, requires no further Proof or Demonstration, than that of their proceeding upon the same Principles, and being perfectly conformable to the establish'd Order and Methods which Nature takes for obtaining the same two General Ends; both in the Animal, and Vegetable World, &c.

C H A P. V.

Contains some general Remarks upon the mechanical Effects of the Air, when excited and put into a tremulous, oscillatory, vibrative Motion, by some strongly sonorous Bodies or Instruments; wherein some general Principles are describ'd for constructing of a Sounding or Phonick Machine, with the surprizing Effects and Alterations that may be produc'd in the animal Solids and Fluids, by the Air when thus modiefed, and put into such a particular State and Law of Motion, and being properly collected, apply'd, and made to operate upon the humane Body, either universally, or only partially and topically; in such wise as to become one of the most efficacious universal Kinds of Exercise for Preserving Health, as well as a most sovereign Remedy for the Cure of Diseases, &c.

1. **I** Have already shewn the Air to be the great universal Principle and Instrument of Nature, by the ever variable Influence and Effects whereof upon animal Bodies, whatever relates to their Life, Health and Diseases, is in a Manner wholly regulated; and to answer those important Ends and Purposes, the same is endow'd with all the necessary mechanical Properties and Qualities, that any other Medicines or Remedies have, and in a more perfect eminent Manner, as Fluidity, Gravity, Elasticity, Pressure, Heat, Cold, Humidity, Dryness, Motion, &c. in what Manner those several Properties and Qualities of the Air may be apply'd, and made to operate upon the humane Body, either singly, or combin'd, in all Degrees, Quantities, and Proportions, with a View either to preserve Health, or for the Cure of Diseases, may be found describ'd in the foregoing and following Parts of this Treatise.

2. I come now in this Place briefly to consider that Property which the Air has in common with all other Bodies, namely, its Motion; and that so far only as it relates to and affects the humane Body: The Air then we may consider as subject to a twofold Kind of Motion, by the first whereof the Air becomes mov'd with a rectilinear Motion, being carried in a Stream or Current directed towards some Point of the Horizon, as when it happens to be agitated by Winds; by which Motion, the same numerical individual Quantity of Air becomes really translated successively from one absolute Place or Part of infinite Space, into another. Or, secondly, the same numerical individual Portion of Air being confin'd, as suppose in a large Vessel, or close Room, so as none of the said Quantity of Air can get out; if within such a close confin'd Vessel or Room, any strongly sonorous Bodies or Instruments, such as several Drums were set a Beating, or several large Bells to Ringing, or a Number of Men employ'd with large Sledges or Hammers (after the Manner of the Copper or Anchor Smiths) for to beat either upon a large Copper Vessel, or upon a Number of Bells properly suspended; in which Case this confin'd Quantity of Air, without ever changing its absolute Place or numerical Space, will become nevertheless strongly mov'd and agitated in all its Parts, and that with a most quick, strong, vibrating, tremulous, undulatory Motion, in such wise that a Person being inclosed within such an artificial aerial Vortex, agitated by the quick, strong, reciprocal Pulsations, of the sonorous Waves or Rays, issuing and returning alternately and successively to, and from the sonorous Bodies; will find himself very differently affected from what he would be by being in the open Air, supposing it to move with all the Velocity that it is observed to have in the highest Winds, by which rectilinear Motion, the Air or Wind only dashes and impinges but against one half of the Person's Body, the other half of his Body being becalm'd or surrounded with an Eddy or Kind of Vortex; but in the other Case the Air being closely confin'd, the quick strong Vibrations and Oscillations that are communicated thereto, become reflected and reciprocated backwards and forwards successively, so as to impinge and strike against all Parts of the Person's Body equally alike; whereby the Person's whole Body, both Solids and Fluids, in all Parts from the Surface to the Centre or Axis, will become subject to a like universal, tremulous, oscillatory Motion, by which extremely quick, successive, smart Vibrations or Systoles and Diastoles, thus alternately excited and continued in the animal Solids, they will be thereby enabled to comminute, mix, and assimilate

the compounding Principles of the Blood perfectly together, and thereby render it fitter for the Offices of Circulation, Secretion, Nutrition, &c. and the same will serve like to an universal Menstruum or Ferment to dissolve the Texture of the Blood when too fizy and cohesive, and thereby remove and prevent Obstructions throughout the several Series of Vessels and Glands; and moreover the Solids by those quick strong Vibrations communicated thereto by the Air thus modified and modulated in its Motion, will become thereby enabled to expel, shake and throw off any extraneous noxious Bodies, that may have insinuated themselves into their Pores and Interstices, and thereby obstructing their natural tonick Motions, and destroying their Spring and Resort, &c.

3. Now such an artificial resounding Air-Room or Phonick-Chamber, may be constructed with many Contrivances to augment and heighten the Effect and Motion of the Air upon the Person's Body, and for this Purpose the Ceiling at Top of the Room may be constructed in the Form either of an elliptical, parabolical, or hyperbolical Cupelo or Dome, so that the Person being plac'd in the Focus of this concave Arch or Vault, all the sonorous aerial Rays or Waves will be reflected therefrom, and made to converge to the Focus, and become strongly collected, directed and impress'd upon the Person's Body. And in order still further to magnify and heighten the Effect of this Motion of the Air upon the Person's Body, the Sides of this resounding Air-Vessel, Room or Chamber, may be form'd with several Concave Niches or Arches, either spherical, parabolical, &c. having all one common Focus with the concave parabolical Cupelo at Top of the Room or Vessel, whereby the sonorous Rays reflected from all those several concave Vaults, being all collected into one common Focus, will form a mighty strong Kind of aerial Vortex or Whirlpool, variously agitated, reciprocated, and made to impinge and reflect alternately, and with great Celerity against the Person's Body. Moreover the Effect following from this tremulous pulsatile Motion communicated first to the Air, and by that to the Person's Body, may be increas'd, accumulated, and augmented still further, by supposing the Person's Body to be inclosed within a Vessel or Receiver such as R R R R, (*Vide* Fig. 9. Plate 2. with the Plan, Fig. 10. corresponding thereto) and have the Air condens'd about his Body, which Receiver suppose to communicate with several large sonorous Vessels of Copper or Brass, such as B B B B, B B B B, &c. by means of the Pipes c D, c D, &c. if now several Persons are employ'd and set to work for to strike successively and orderly with great Sledges or Hammers upon the Receiver, with the several Vessels communicating therewith, after the Manner of the Copper or Anchor Smiths, in that Case the Air in the several Vessels B B B, &c. being put into a violent smart vibratory Motion, the like Motion will be communicated to the Air surrounding the Person's Body in the Receiver, which will become thereby subjected to a Series of smart quick reciprocal Pulsations, or universal Systoles and Diastoles, and thereby receive all the Advantages arising from this new mechanical Method of exercising the Body by communicating a new additional Quantity of Motion thereunto; which will prove of very extensive Benefit and Efficacy, consider'd either as it will afford the most natural, perfect, universal Kind of Exercise, as it may be apply'd to all Sorts of Persons, even the most antient and infirm, &c. who can take the Benefit of no other Exercise whatever; and moreover this Method of exercising or communicating Motion to the animal Solids and Fluids, will serve as the most universal sovereign Remedy for the Cure of many Diseases; that it must be attended with both those salutary Effects is abundantly plain and demonstrable from the Laws relating to the Communication of Motion, Percussion, Impulse, Harmony, and the humane Mechanism, &c. That the animal Solids must receive great Benefit hereby is evident, for by the quick, strong, alternate Vibrations that will become produc'd and kept up therein for any proper reasonable Time, such Parts as are no longer fit to be retain'd in their Texture and Composition, as being either worn out, or being in their own Nature incompatible and unassimulable with the Structure of the animal Fibres and Solids, will become thereby disengag'd, separated and cast out, and thereby Room made for the Introduction and Attraction of other Particles more homogeneous and of a similar Nature and Composition with the animal Fibres; from whence will follow a perfect healthful Nutrition and Reparation of the Solids; and as the Solids will be greatly benefited and strengthened by this most salutary Exercise, the Fluids must also by necessary Consequence have their Texture, Crasis and Temperament greatly mended and improved thereby, by having their Lentor dissolv'd, and render'd more fluxil and passable through the several Series of Vessels and Glands, and thereby serve for curing Obstructions in all Parts, with Tumors, Atrophies, Consumptions, Asthmas, Dropsies, Cachexies, Agues, relax'd Nerves, &c.

4. Moreover, not only the whole Body, but every particular Region and Member thereof, may be made separately and independently by itself alone, to receive the mechanical Effects of the Air when thus modified and put into such a tremulous undulatory Motion. Now this most useful Problem of communicating Exercise, by means of a new additional vibrative Motion, to every Part and Member separately and by itself alone, without subjecting the whole Body thereto at the same Time, may be solv'd and effected, by having a proper Vessel or Receiver fitted to the Part or Member; thus suppose it to be the Breast of a Person affected with a Tumor, &c. for that Purpose let a proper Receiver be provided, such as a b n n, (*Vide* Fig. 11. Plate 3. with an Orifice capable to receive within it the whole tumified Breast b, round the Mouth of which Receiver (a separate View whereof is shewn by Fig. 16.) must be form'd a smooth flat Ring, which may be cover'd with soft Leather; to make it sit both easy and close upon the Part; the Receiver

being

being apply'd to the Breast, and kept fast on either with the Person's own Hand, or an Assistant, or with Bandage; let the Cock of the Pipe *z p* be set open, and the End *z*, of the Pipe be join'd to the End *x*, of the Pipe *x p*, of the single Brass or Copper Vessel *b b b* (or of the compound Vessel represented by Fig. 9. and 10. Plate 2.) which may be also a Drum, Bell, or any other strongly sonorous Body: If now either the Person himself, or an Assistant, or more Hands, when there is Occasion, be employ'd and set to Work with large Hammers or Sledges, for to beat orderly and successively upon this sonorous Body *b b b*, the Air therein will be put into a violent, tremulous, vibratory Motion; which Motion will be communicated to the Air in the Receiver by the Pipe *z p*, and the Air in the Receiver will communicate and impress the like smart, undulating, pulsatile Motion to the whole System of Vessels contained in the Breast, with the Fluids therein; whereby the languid oppress'd Resort and Spring of the Solids will be rous'd up and excited to Action and Motion, and be thereby enabled to subdue, attenuate, and propel the inactive, stagnating, sly Fluids, and thereby dispose and fit them, either for being resum'd back into the Vessels, or to be discuss'd and breath'd out by the Application of warm Fomentations or Vapor-Baths, &c. or else for to bring the extravasated Humours to a laudable Digestion and Suppuration.

5. And by having another such like topical Machine or Receiver *a b n n*, adapted to the Penis, as is shewn by Fig. 10, that Member may be made to receive all the salutary Effects arising from this new mechanical Way of Exercise with the Air; which being apply'd with Judgment, and at proper Times, in the Progress of the Cure of the Disorders incident to this Member, will contribute greatly to advance and expedite the Cure, by exciting such an oscillatory vibrating Motion in the Vessels and Solids of this Part, which will thereby be put under a strong Effort and Nisus, and enabled to shake off and expel the venereal saline Spiculæ adhering to them, and destroying their Elasticity and tonick Motions, &c.

6. And by having such like proper topical Receivers or Instruments made to fit to all the Regions and Parts of the Body (as may be understood by the Draughts, Fig. 6, 7, 8, and 9, of Plate 1. by supposing the Receivers *b b b b*, apply'd to this sonorous Machine) they may be all made to receive the like Benefit of this most perfect Kind of Exercise from the Air, which is the natural Element to which the humane Body is committed and accustom'd from the first to the last Period of its Existence; and the same appears to be intended chiefly for this End, of keeping the Bodies of Animals and Vegetables, in a continual but variable State of Motion and Exercise.

7. It is moreover propos'd, that this new Method of applying the Air thus modify'd, with respect of its Motion, will also be of great Use when judiciously and seasonably apply'd at proper Times, not only to promote and expedite the Cure of Tumors; but likewise of Wounds, Ulcers, Inflammations, Eruptions, Gangrenes, &c.

8. The humane Body being an Elastick vascular compressible Machine, upon its being plac'd in the compound Focus of such an artificial Atmosphere or aerial Vortex, thus strongly agitated on all Sides by the sonorous Rays or Waves reflected from several parabolical or hyperbolical Vaults, must have all its Parts, both Solids and Fluids, subject to the like universal, tremulous undulatory Motion of Systole and Diastole, beginning at its Circumference, and propagated inwards to its very Center or Axis, from whence the Motion becomes again reflected outwardly from the Axis to the Surface of the Body; and thus the whole animal System will continue to oscilate and vibrate, or contract and expand successively, and with great Velocity, during the Time it is subject to this Exercise or Motion of the Air, with which it will keep exact Time, like to two unison Chords or Instruments: That this must be the Case and Effect is demonstrable from the Laws relating to the Communication of Motion, and the animal Solids being all eminently elastick. Now that the mechanical Effects produced by such strong, quick, vibrating Pulsations impress'd upon the whole animal System, must be very great and surprizing, is abundantly manifest from the Laws of the animal Œconomy; forasmuch as it has already been observ'd in the Introduction, &c. that whatever Changes are wanted or intended to be produced in the Body, either with a View to establish Health, or for the Cure of Diseases, can be effected no other Ways, than by adding or subtracting Motion, either to, or from the whole Body; or to, and from its Parts; and the real Effects and Operation of all Medicines and Means of healing, consist wholly in the Quantity of Motion which they are capable for to add or subtract either to, or from the whole Body, or its several Parts; and in regulating the Direction and Distribution of this Motion. This being the Case, the Air then thus apply'd, will become the most universal of all Remedies, as well as the most safe, certain, and efficacious, as we can by means thereof impress what Quantity of Motion we please, either upon the whole Body, or its several Parts, and likewise for to regulate its Direction. Now this Method of applying the Air thus modify'd, with respect to its Motion, operates and produces its Effects upon the Body by much the same mechanical Principles as that of Friction with a Flesh-Brush, or rubbing with the Hand, or a Cloth; which is found to be of great Use and Efficacy in many Cases, for to sollicit and excite the languid oppress'd Solids, by causing their little Machinulæ or Springs to be frequently and gently bent by rubbing; whereby they recover their natural Elasticity and tonick Motions, and so be-

come enabled to subdue and overcome the Incumbrances laid upon them, from the sluggish Disposition of the Fluids.

9. But to bring the Comparison and Parallel still nigher, and to demonstrate that the new mechanical Method of applying the Air thus modify'd, with respect of its Motion, to the humane Body, in the Manner here described, must necessarily produce the salutary Effects and Changes as has been alledg'd, I shall for that Reason consider it in another View and Light; and that is, as it is really and properly a Species and Kind of Musick or Harmony, only of the strongest, coarsest, harshest Sort; and whereas common Musick is adapted chiefly to excite proper harmonious Motions upon the auditory Organs, so this new mechanical Kind of Musick is intended to be raised to such a Pitch and Degree of Strength, as to become sensibly felt throughout the whole Body (in which Case should it prove too strong for the Ear, the same may be secured from its Effects, by having a proper Glass Vessel or Receiver fitted to cover the same) so that this by Way of Distinction may be named, a Kind of mechanical Musick; being designed for producing harmonical Motions or Vibrations throughout the whole Body or nervous System, in Opposition to the other Sort, which is designed only to please the Ear. This being the Case, consequently the Effects which this new Sort of mechanical Musick will have upon the whole animal Machine, will be analogous and similar with those of common Musick, only differing in Degrees, the Effects in both Cases proceeding from the same Cause, namely, the Motion of the Air differently modify'd, and made for to operate with different Forces upon the nervous System. And whereas Musick is observ'd to have a general good Effect upon Mankind, by exciting, inspiring, and rousing up the Powers and Faculties both of the Body and Mind, to a more exalted, perfect Pitch and Disposition for acting in general, in which Respect Musick may really and properly be consider'd as a Kind of universal Medicine or Exercise, both to the Body and Mind; and this its Efficacy is owing wholly to the harmonious Motions, Vibrations, and tremulous Pulsations, thereby communicated to the elastick Solids and Nerves, but chiefly those ministering to the auditory Organs, by which they become convey'd and propagated to their original or common Sensorium in the Brain. Of the mighty Effects of Musick, History (both sacred and prophane) furnishes many Examples, among which I think none more famous and surprizing than the remarkable Instance and Case of the Tarantula, of which extraordinary Phænomenon, we have the most perfect Account and Solution given by the learned Dr. *Mead*, in his Treatise upon the mechanical Effects of animal Poisons.

10. The humane Body, consisting of a System of Solids eminently elastick, like to a most finish'd exquisite string'd musical Instrument, the Chords whereof being duly tense and stretch'd, become extremely susceptible of Motion from the least Impressions of external Objects; in such wise, that the smallest Sound or Motion of the Air causes the whole humane Frame and animal System to vibrate inwards and outwards, from its Circumference to its very Center or Axis; and as the Degrees of Elasticity, Stricture, and Tension of the animal Solids, are different in every individual Person, and in the same Person at different Times; from whence we become furnished with the best Reason of accounting mechanically for the different Idiosyncrasy, Temperaments, Antipathies, Passions, &c. with the different Effects which Musick or Sound, &c. must have upon different Persons, as well as upon the same Person at different Times; which Diversity of Effects depends altogether upon the Tension and Stricture of the animal Solids, which admits of infinite Degrees in the several Individuals, and great Variety and Difference in the same Individual at different Times. And from hence it is manifest, that Sound or the Air, when put into a tremulous Motion, will have as different Effects upon different Persons, as also upon the same Person at different Times, either for preserving their Health, or the Cure of Diseases, as any other Kind of Means or Medicines, whether Emeticks, Catharticks, Diureticks, Sudorificks, Walking, Riding, Bathing, or any other Kind of Exercise, &c. For as the same Kind and Quantity of any Medicine or Exercise, &c. will not suit all Persons alike, so neither will the same Kind and Degree of Sound or Musick produce an equal Effect upon all Persons alike. Now the salutary Effects of Musick or Sound hath hitherto been attributed to its Influence and Operation upon the auditory Organs and Nerves only; this however I think too restrain'd and limited a Way of accounting for its Operation and Effects, forasmuch as the whole nervous System, and by Consequence the whole animal Machine, both Solids and Fluids, must become very sensibly and really mov'd and affected thereby. Now after what Manner the Body will become affected by the Air when put into such a vibrative Motion, and apply'd by a proper Machine either to the whole Body, or some of its Parts only, may be understood by viewing the Draught, Fig. 9. Plate 2. whereby is shewn the Picture or Section of a humane Body, inclosed within such a phonick, sonorous Machine, as before described; the external Surface of the Body being defin'd by two concentrick parallel Lines, the outermost whereof being one real continued compound Line, but the innermost is a prick'd or discontinued Line, the Interval or Space between which two Lines, serves to represent the universal Vibrations, Tremors, and Pulsations, which the whole Body will be subject to during the Time of its being inclosed in the Machine; the Quantity and Velocity of which Vibrations thus excited in the Body, will be in Proportion to the Intensity of the Sound, and the Degrees of Tension in the animal Solids for that Time, &c.

11. We are moreover furnished with another common remarkable Instance and Proof of the great Influence and Effects of the Air, when apply'd according to the Principles of this new Method, and becomes directed and made to act with alternate, quick, successive Strokes and Impulses upon Bodies; for it is by a like Mechanism that the Air operates in the Production and Continuation of artificial Fires, such as are fed and nourished with a proper Pabulum; now there is nothing more required to the Generation and Conservation of artificial Fires, than to collect and concentrate elementary Fire, which is diffused equally throughout all Spaces and Places, by giving a new Direction thereto, either by Attrition or Attraction, as with a Burning-Glass, &c. by which it receives a new Determination and Refraction, and made to converge to a Focus, where the Rays being condens'd and congregated, and being supply'd with proper Matter or Fuel, a visible Fire will be thereupon generated and produced; about which newly produced Fire, the Air immediately forming a concave spherical Mould Furnace or Vault, closely embraces and compresses the same all around; which aerial elastick Mould is kept continually vibrating inwards and outwards, by its own Weight and Elasticity, and the contrary repelling Force of the Fire, endeavouring to fly off and make its Escape: Now this elastick Air-Mould or Vault, by its continual Vibrations, or Syctoles and Diastoles, serves for to break, divide, comminute and mix the Particles that are already ignifed and saturated with the elementary Fire, with the other fresh Particles of the Fuel that are not yet actually laid hold of by the Fire, or as yet but beginning to be ignifed; whereby the Fire thus once begun, becomes supply'd with fresh Particles from the next Parts of the Fuel, which are continually protruded and thrust in by the alternate Vibrations of the Air surrounding the same; much after the same Manner as the Blood is kept mix'd with the Chyle, by the alternate Vibrations or Syctoles and Diastoles of the Lungs, this aerial Mould being to be consider'd to operate upon the Fire, in a Manner analogous to what the Lungs do upon the Blood. So that this vibrating Motion, Oscillation, and Pressure of the Air, becomes equally and for the very same Reasons, necessary to the Production and Conservation of artificial Fire, as it is to the Life of Animals and Vegetables; and that from the same Principles and Mechanism. And such Parts of the Fuel, out of which the Fire has extracted what is fit for its Support and Nourishment, either precipitate in Form of Ashes, or ascend in Smoak, being carry'd up into the Air, which serves also at the same Time as an exhaling Medium thereto, and when the Fuel is all consumed, the elementary Fire becomes diffus'd equally every where as before, without the least Diminution, and only disappears until it becomes excited and brought into Action by some proper Cause determining it thereto, &c.

12. As the Methods describ'd in this Chapter for preserving Health, and the Cure of Diseases, depends upon the Communication of a tremulous Motion, either to the whole System of the animal Solids and Fluids, or only to some particular Region or Member of the Body, by means of the Air being first put under such a particular State and Law of Motion, and made to communicate the like tremulous vibrative Motion to the humane Body; which being a compressible vascular Machine, and eminently elastick, becomes very susceptible and retentive of this particular Kind of Motion: Now all Motion may be distinguished under three general Divisions, namely, rectilinear, curvilinear, and tremulous or vibratory. Bodies being affected either with the first or second Kind of Motion, may be mov'd from one absolute Space or Place to another, whilst all the Parts and Particles of the said Body are relatively at Rest among themselves; but when any Body becomes affected with the third Kind of Motion, each of the most minute Particles of the said Body is continually changing its relative Place with Respect of the other compounding Particles, notwithstanding the whole complex Body may at the same Time be supposed to occupy and remain in the same absolute Place; or be mov'd either with a rectilinear or curvilinear Motion, from one Part of universal infinite Space to another. And however the Modus whereby Motion is produc'd and communicated, is as inexplicable as are the simple original Ideas produc'd in the Mind, from the Impressions of external Objects upon the Organs of Sensation, yet nothing is more certain than that there is such a tremulous oscillatory Motion and Agitation continually impress'd upon the whole universal System of Matter, and all material Beings; which tremulous reciprocal Motion may be conceived to bear the like Analogy and Relation to the general System of Matter, which the Soul or Principle of Life does to animal organiz'd Bodies; for as an animal Body without a Principle of Life can perform no Operations, so Matter without Motion can produce no Effects, but would for ever remain in a State of absolute Rest and Inactivity, without ever undergoing any Mutation or Change whatever; so that what Effects and Changes happen to Bodies, the same are all necessarily produc'd by Motion alone, of which they are no more than the Effects only; so that Motion is the principal Cause and Instrument whereby all the Alterations that happen to the Body are produc'd, it being impossible for any Body, or System of Bodies, to become any wise affected, chang'd, or alter'd for the better or worse, but from some Quantity of Motion either impress'd thereupon, or deducted therefrom, let the Cause thereof be what it will, material or immaterial.

13. Now the general Causes and Instruments which God (the First Cause and Author of all Motion and Being) makes use of for producing and communicating Motion, are the Powers of Gravity, or Attraction, and Repulsion, elementary Fire, Air, Elasticity, Magnetism, &c. Thus

we find the Sun, that immense Body and intense Focus of concentrated elementary Fire or Light, by his continual strong Vibrations and Impulses upon the fluid Ether and Medium of Light, diffus'd every where throughout the visible Universe, continually producing and propagating such a tremulous vibrating Motion in all Bodies, which tremulous Motion serves as the universal Ferment, Spirit and Soul of Matter, whereby it is kept always disposed to change, and to assume new Forms, tending either to the Accretion and Perfection, or Dissolution and Corruption of Bodies; without which tremulous Motion, whereby Matter is kept in a continual Luctus and Fermentation, the same would otherwise coalesce and become one unactive Mass, unfit for the Generation and Production of any Beings, just in like Manner as the Earth would become barren and unfit for Vegetation, was it not kept by daily Labour, dug, plow'd, mix'd, mov'd, manur'd, and intimately agitated by the Solar Rays, &c.

14. I shall not here undertake to decide that famous and much controverted Question, namely, whether there be the same Quantity of Motion at all Times existing in the material Universe, as some Philosophers maintain; or whether Motion may, and is not destroy'd and generated, or produc'd *de Novo*, as others affirm; wherefore leaving this as a Point yet undecided, I shall proceed to observe only what we are certain to be real Matter of Fact, namely, That there is such a tremulous Motion, more or less, continually impress'd upon and communicated to all Bodies within this Solar System, is certain, from the Propagation of Light, either from the Sun, or other ignefied luminous Body, which I humbly conceive to be effected by a constant, impulsive, vibratory Motion, impress'd either by the Sun, &c. upon the Fluid of Light, which consisting of Particles endow'd with the greatest Subtily and Elasticity, serve to convey, transmit and propagate, the like vibrative tremulous Motion successively, with incredible Velocity and a rectilinear Direction, to immense Distances: The Fluid of Light itself, or the Ether, being always equally diffused and existing the same in Quantity throughout the System, and this by Night as well as Day; but in order to bring it into Action or Motion, and to render its Effects sensible, there is required the Presence of some Body actually luminous, or in which the Fluid of Light is really condens'd and concentrated in a much greater Quantity, than what it is in other Parts of the said Fluid, the Degrees both of Light and Heat in Bodies, being wholly owing to the different Degrees and Quantities of Light or elementary Fire condens'd and accumulated therein; in like Manner as the Sun's Rays, when made to converge, and being collected into a Focus, become intensely hot, luminous and visible, only from their greater Density and Spissitude. For was that Hypothesis true, which supposes Light to consist in a real Efflux and Emanation of Particles thrown off and projected from the Body of the Sun, it would overthrow the Law of Gravity and universal Attraction of Matter, with all the Systems that have been grounded and built thereupon; for if the Sun be allow'd to attract, and retain all the Planets in their respective Orbits, and keep them from flying out of the same, which they would otherwise do by the centrifugal projectile Force, were it not for the centripetal Force of Gravity, whereby they constantly tend towards the Sun, consequently by a much stronger Reason it follows, that no Parts nor Particles how subtile soever, can be thrown off or projected from the Body of the Sun, by reason that the Power of Gravity, whereby the Parts and Particles of the Sun's Body do mutually attract each other, is much greater than the centrifugal Force produc'd in the said Particles from the Rotation of the Sun about his Axis, and which is the principal Reason that can be offer'd in Support of this Hypothesis. Besides the Sun's Body must have many Ages ago been wholly dissipated and dissolv'd upon this Supposition, that the Particles which compose the same are thus continually flying off in concentrick Surfaces and Lays, for to maintain and supply the Expences of Light and Heat throughout the Planetary System, &c.

15. Thus then we see that our Bodies are at all Times subject to such a tremulous Motion, produc'd and kept up therein by the continual Action both of elementary Fire or Light, as also by calling in the Aid and Assistance of artificial culinary Fire, when the former alone is too weak and insufficient for the above End. And moreover, the Air being an elastick Fluid, and evermore subject to such a tremulous Motion from the Action of elementary Fire and Light, with that of sonorous Bodies, the same serves likewise as another general Cause for impressing and communicating such a tremulous Motion continually, more or less, to all animal, and other terrestrial Bodies.

16. A tremulous Motion may be produc'd and propagated to immense Distances not only in fluid elastick Bodies, as is the Case in the Propagation of Light and Sound, but likewise in solid Bodies, that are continuous and elastick; thus, if one End of a Cord, or Wire, be struck upon, there will be produced a Tremor throughout its whole Length, let the same be ever so long; and so small a Stroke as that of the Beat of a Watch being apply'd to one End of a Piece of Timber, will be communicated and propagated through its whole Length, as is evident by its being sensibly heard by applying the Ear to the other End: Moreover the Effects of a tremulous Motion may be further observ'd in the Case of two Clocks, which being plac'd upon the same Floor, or against the same Wall, though at the Distance of a hundred Yards or more, may notwithstanding affect each others Motion, by the Tremors and Pulsations communicated really, though imperceptibly, by the Movement of each Clock, to the Boards or Wainscot, and by the elastick Fibres thereof become reciprocally propagated from one Clock to the other. Much
after

after the same Manner as two unison Chords of any two musical Instruments, if one of them be made for to vibrate or play, the other will at the same Time be brought into Consent, and become agitated with the like tremulous Motion, which Phænomenon and Effect can be accounted for from no other Principle, but that of a vibrative reciprocal Motion, produc'd by striking the first Chord or String, and is from thence transferr'd to the second, by means of the like vibrating oscillatory Motion impress'd upon the Air, by the similar Motion of the first String. And just in the same Manner the human Body consisting of a Contexture of Tubes and Solids, &c. greatly elastick, and endow'd with the most exquisite Sensation, may be consider'd as a most perfect musical Instrument, which is ever more or less affected with such a vibratory Motion throughout its whole Substance, from the Action of the general Causes aforementioned, and from the Action and Motion of every Body surrounding us; and by this Principle I think we may best account for those singular Instances of Sympathy and Antipathy, which some Persons have to certain Objects, and why Yawning becomes Catching, &c.

17. Moreover, most of the subtil surprizing Phænomena and Effects which we meet with in Nature, appear to be produced and to be the Effects only of such a tremulous Motion, such as are the Phænomena produced by rubbing of electrical Bodies, and thereby putting them into such a vibrating Motion, and exciting them to Action, whereby they acquire a Power of Attracting and Repelling light Bodies. All which Effects relating to electrick Bodies, I humbly think may be adequately deduced and accounted for from the above Principles, without having Recourse to any imaginary fictitious Fluid or Effluvia, that may be call'd specifically and properly electrical, or to any Radiation or Emanation of Particles, properly such, flowing from the electrical Body when excited to Action or Motion, and communicating the like Motion to Bodies at a Distance; forasmuch as all those Appearances may be accounted for from much more simple and obvious Causes, namely, from the vibrative oscillatory Motion produced first in the electrical Body by Attrition or Rubbing the same, which Motion becomes from thence communicated both to the Fluids of Air, and Light, and by means of a Series of elastick continuous Bodies duly disposed, the same may be propagated by those two Fluids to considerable Distances; whereas one may as well undertake for to account for all the Appearances relating to the Motions of the cœlestial Bodies by the *Cartesian* Hypothesis of Vortex's, as to pretend to solve the Phænomena of electrical Bodies by means of any Fluid specifically or properly electrical, or the Efflux and Emanation of any Effluvia, really such, issuing out of the electrick Body, when excited to Action or Motion. And the Truth of what is here advanc'd, is further confirm'd and establish'd from this Observation, That such Bodies as are endow'd with the greatest Degrees of Elasticity, are found to have the greatest Electricity, as being the most susceptible and retentive of those vibratory Motions and tremulous reciprocal Pulsations, from which alone, as the true and proper Cause, all the Phænomena and Effects of electrical Bodies appear to be produc'd. Besides, it is impossible to conceive how any electrical Effluvia radiating and issuing out of the electrick Body, can have its Direction changed in a thousand different Ways, as it is in passing along a Rope or Line, bent into many Folds and Returns, and in all manner of Directions: Whereas it is easy to conceive how a tremulous Motion may be communicated to such a Rope by the Fluids of Air and Light, and be propagated through its whole Length, by applying the electrick Body when excited and put into Motion, to one End of the Rope. Moreover all radiating Bodies emit their Qualities to equal Distances, *in orbem*, or spherically; whereas Electricity requires the Application of other Bodies, to render its Effects sensible at any considerable Distance, &c.

18. Notwithstanding what hath been here remark'd relating to Electricity, may be accounted as a Digression foreign to the proper Subject of this Treatise, we may however deduce therefrom a new Mechanical Method which will be of real Efficacy, and contribute much to the Cure of Wounds, Tumors, Paralitick, and other Topical Ailments and Disorders; namely, that as all Bodies when heated, either by Rubbing, Attrition, &c. will emit Effluvia (which however as has been before observ'd, are in no wise to be accounted as the Cause of those Effects commonly call'd Electrical, and observ'd to follow therefrom) yet nevertheless as those Effluvia, when copiously rais'd and emitted by intense Rubbing and Attrition, are ever accompany'd with an intense Motion and Vibration, which becomes impress'd at the same time upon the Fluids both of Light, and Air: If such Bodies, especially those of the resinous Kind, &c. when strongly rubb'd and excited to Action, are apply'd or kept nigh to any ailing diseas'd Part, and have their Force renew'd from Time to Time as the same becomes destroy'd, and kept thus fresh apply'd to the Part for a proper Time, and at reasonable Intervals; the smart quick Vibrations, which the Effluvia thus issuing from the said Bodies, in conjunction with the Fluids of Light and Air, will communicate to the diseased Member, to which they are thus apply'd, will contribute greatly to assist and restore the lost Tone, Spring, and Elasticity of the animal Solids and Fibres, as the same will serve like to a dry Vapour-Bath, and thereby enable them to overcome the Incumbrances and Resistance laid thereon by the stagnant viscid Fluids, &c. The Rationale and Mechanism, by which all those salutary Effects become produced, are abundantly manifest from the Laws of the Animal Œconomy, &c.

19. That the new Mechanical Methods for Preserving Health, and Curing Diseases, describ'd in this Chapter, must be accompany'd with all the salutary Effects ascrib'd thereto, requires no

farther Demonstration, than that of their being perfectly agreeable with the establish'd Order and Method pursu'd by Nature for attaining the same two general Ends; both in the Animal, and Vegetable Kingdoms.

C H A P. VI.

Contains the Construction, Description, Use and Application, of sundry topical Machines, whereby the several Regions and Members of the Body may be made to receive all the salutary Effects that can be obtain'd from that universal Principle of Pressure, apply'd thereto in all Degrees, either by Means of Water, or Air; with all their other Properties and Qualities so regulated, adjusted, and proportion'd, as will best answer the Indications of Cure, &c.

1. **H**AVING in the first two Chapters describ'd some new Methods and Machines whereby the whole Body might be subjected to all Degrees of Pressure, either by Water alone, or with Air alone, or with both the said Elements jointly combin'd and allied together; I come now to propose some new Methods and Machines whereby the several Regions and Parts of the Body may be likewise subjected to all Degrees of Pressure, &c. by either one or both the said two Elements, and be made to receive besides all the Benefit arising from the Use and Application of Vapour-Baths, humid or dry, &c.

2. But first of all it may be observ'd, that one principal End of applying topical Baths, is either to direct or cause a more plentiful Derivation of the Fluids to some particular Part, as when it is intended to forward Suppuration in Tumors, as also in paralytick Cases, or the Suppression of any natural Evacuation, &c. or secondly, to divert and cause a Revulsion of the Fluids from some Part or Region, as suppose the Head and superior Parts, as in the Cases of Apoplexies, Quinsies, Ophthalmies, Hemorrhages, and in all Affections of the Brain and nervous System, (when the same proceed from too plentiful an Afflux and Derivation of the Fluids thereto) or when any of the natural Evacuations are increas'd above what is the standard Measure of Health, &c. This general Remark being premis'd, I shall now proceed to the immediate Subject of this Chapter, and describe some new Methods for constructing and applying of topical Baths, &c. whereby those two primary medicinal Intentions of Derivation, and Revulsion, or what relates to the Distribution of Motion in the several Parts of the animal Machine may be most successively obtain'd. For this Purpose, *Vide* Fig. 6. Plate 1. which represents the same Sort of Bathing-Vessel and Apparatus (as has been describ'd in the first Chapter from Number 6 to 12) serving to bathe the whole Body; but in this particular Case and Manner of using the Machine, only the upper Region or half of the Person's Body, from about his Loins upwards, is inclos'd in the Bathing Vessel; the Hole in the Bottom n n of the Vessel whereat the Body enters, must be secur'd all round with soft Leathers, fastened thereto by a flat Ring with Screws, so as to resemble the Leather-pouch of a Budge-Barrel, which Leathers are to be made fast to the Person's Body with Rowlers (those Leathers and Rowlers are not express'd in this Draught, to avoid embarrassing the Figure therewith, and as the same are readily to be understood without any linear Representations) all Things being thus dispos'd, we may now proceed to the Operation of bathing the upper Region of the Body, with Water cold or hot; and in either Case the Water may be made to rise just so high as to cover the Person's Head, or only as high as his Neck, Breast, &c. so that upon bending his Body, or keeping the same erect, he can bring his Head either all under Water, or raise it above as he has Occasion to take Breath, &c. the Bathing Vessel being fill'd with Water to the Height intended, let the pneumattick Engine aaaa, be set to work to give the Air in the upper Part of the Bathing Vessel the Degree of Density and Pressure, that is judg'd will suit best with the Symptoms and Indications of the Person's Case, which I will suppose to be such as calls for a speedy and powerful Revulsion of the Fluids from the superior Parts, as in Apoplexies, Quinsies, Peripneumonias, Hæmorrhages, Inflammations either of the Meninges of the Brain, Eyes, Face, &c. in which Cases let the Bathing Vessel be fill'd to a proper Height either with simple Water, or with Water prepar'd and medicated with proper Ingredients endow'd with specifick appropriate Virtues, for contracting, relaxing, resolving, discussing, &c. which being done, let the Air in the Bathing Vessel be brought to have that Degree of Pressure as is judg'd will suit best with the Person's Case. If now at the same Time the lower Part of his Body that is without the Bathing Vessel, be understood to be plac'd in a Vessel with warm Water (which Vessel is not shewn in this Draught) in which Case the Blood-Vessels ministring to the Head and superior Parts being more compress'd by the Air in the Bathing Vessel (which in this Case is suppos'd to be of a greater Density than the external Air, which presses upon that Half of his Body withoutside the Vessel) than the descending Blood-Vessels ministring to the inferior Parts, which are press'd upon only by the external Air, and the cold Water in the Bathing Vessel by its Stimulus, tending also to contract and lay a greater Resistance upon the ascending Vessels, whilst the warm Water of the Semicupium apply'd to the lower

Region

Region of the Body, by its relaxing Quality and Stimulus will diminish the Resistance of the descending Vessels, from all which concurring Causes the Fluids will become determin'd in a greater Quantity and Velocity into the descending, than into the ascending Vessels, and thereby cause a Revulsion of the Fluids from the superior Parts, and at the same Time a proportional Derivation thereof to the inferior Parts, as was propos'd and intended. And, on the contrary, was the Fluids requir'd to be directed in greater Quantity and Velocity to the upper Parts, for which Intention, let the Bathing Vessel be fill'd with warm Water, and the Air therein be rarified and brought to a Degree of Density and Pressure below that of the external Air by means of the pneumatick Engine, (as has been describ'd in the First Chapter) placing the lower Part of his Body withoutside the Bathing Vessel in a Semicupium or cold Water Bath, upon doing which the End and Intention propos'd will be obtain'd, namely, of making a Diversion or Revulsion of the Fluids from the inferior Parts, with a proportional Derivation of the same to the superior Parts.

3. Now the two general Intentions propos'd in the preceding Numbers, namely, of making a Revulsion from the superior Parts, as the Head, Neck, Breast, &c. in the Cases of Hæmorrhages, Inflammations, &c. or any extraordinary Determination of the Fluids to those Parts; or on the contrary, when it is requir'd to make a Diversion of the Humours from the lower Parts, as in Cases of Tumours, &c. Now it is propos'd that this general Intention of Cure may be effected without having any Water in the Bathing Vessel, only by condensing and rarefying the Air therein, until it is brought to have the Degree of Density and Pressure requir'd to answer the Intention propos'd; which Practice will in most Cases answer better, than by applying Water either to that Part of the Body within, or withoutside the Bathing Vessel. And thus if the Air in the Bathing Vessel be condens'd, and made to act with a greater Pressure upon that Part of the Body inclosed therein, than what the external Air does upon that Part withoutside the Vessel, upon doing whereof this Intention will become answer'd as to the first Case, namely, of revulsing the Humours from the upper Parts. And, on the other hand, if the Air in the Bathing Vessel be rarefied and made to act with less Force and Pressure upon that Part of the Body included therein, than what the external Air does upon the other Part withoutside the Vessel, upon doing whereof, the general Intention of Derivation and Revulsion will become obtain'd as to the second Case propos'd, namely, of making a Diversion or Revulsion of the Humours from the lower Parts, as was propos'd to be done. Suppose now that in effecting of the first Case and Intention, the Air in the Bathing Vessel was rendered twice as dense as common Air, in which Case that Part of the Person's Body inclosed therein, will sustain double the Quantity of Pressure, which the other Part of his Body withoutside the Bathing Vessel does, by which great Difference of Pressure upon the two Parts of his Body, the Fluids will receive a proportional Difference in their Direction and Determination to the said respective Parts. And according to this Method the Air in the Bathing Vessel may be condens'd so as to render its Pressure upon that Part of the Body inclos'd therein, three, four or five Times greater, or more, than what it is upon any other Part of the Body of equal Extent and Area, with the Part inclos'd in the Vessel, and so for all Degrees of Pressure; by which Method it is propos'd the most powerful Diversions may be made, in regulating the Determination of the Fluids to the several Parts, according to the Indications. Now, on the contrary, if the Air instead of being condens'd in the Bathing Vessel, be rarefied, in such wise as to have but half the Density and Pressure of the external Air, then the contrary Effects will follow, for in this Case that Part of the Body within the Vessel will sustain but half the Pressure which the other Part of his Body sustains from the external Air, upon doing which, there will be a proportional Revulsion of the Humours from the lower Parts; and so for all other Degrees of Rarefaction of the Air in the Bathing Vessel. So that as the Pressure may be thus laid on, and taken off the Body in all Degrees, consequently what relates to the general Intention of Derivation and Revulsion, or the Distribution of the Fluids to the several Parts of the Body, may be most effectually regulated according to the Indications.

4. By the other Draught and Section Fig. 7. Plate 1. the Person is represented as receiving the Operation and Exercise of Bathing, with his Body in a contrary revers'd Posture to that describ'd in the foregoing Number, namely, with the lower Part of his Body inclos'd in the Bathing Vessel, and the upper Part expos'd to the external Air; and as this Method and Case differs from the foregoing one only in respect of the Parts of the Person's Body that are inclos'd in the Bathing Vessel or Receiver, so that whatever Intentions of Cure may be practis'd in the first Case, (as describ'd in the last foregoing Number) may likewise be obtain'd in this latter Case and Method, and with greater Safety and less Trouble; what those Intentions are, with the general Methods of effecting the same, has been briefly hinted at in the preceding Numbers, compar'd with what has been said in the first and second Chapters, &c.

5. Moreover, if the Person's Case and Symptoms should indicate the Use and Necessity of applying any Fluid to that Part of his Body included in the Bathing Vessel or Receiver, the same may be done with all Sorts of Fluids, either separately or allay'd and compounded together in all Proportions, such as Water, Milk, Wine, Vinegar, Urine, Oils, distill'd Waters, Decoctions, Infusions, &c. and those several Fluids may have their Virtues further heighten'd by being impregnated with the Particles of such solid dry Ingredients as have a Fitness to advance and forward the Intention.

6. By

6. By those two Draughts, compared with what has been said in the two first Chapters, it will be readily understood how either the upper or lower Parts of the Body may be made to receive all the Advantages and Benefit that can be deriv'd from partial Bathing, as also from Irroration or Fumigation with Vapour-Baths, either humid or dry, simple or compound, and likewise from Pump-Bathing, &c. with the Effects of the Air, as describ'd in the Fourth and Fifth Chapters, &c.

7. By the vertical Section, Fig. 1. Plate 1. a Person is represented as standing upright within the Bathing Vessel, with the Water rais'd to several Heights round his Body, which different Heights of the Water may be express'd by the prick'd Lines w_1 , w_2 , w_3 , w_4 , w_5 , &c. in which Case the Person may be consider'd as subject thereby to so many different, partial, or local Bathings, which may be perform'd with Water cold or hot, and in all Degrees, or with Water or any other Fluids allay'd and compounded together in all Proportions. And supposing the Person to stand with the Water as high up upon his Body as the prick'd Line w_4 (or any of the other like dotted Lines) in that Case the upper Part of his Body, without or above the Surface of the Water, may be made to receive the Benefit of Irroration or Suffumigation with Vapours and Effluvia produc'd from all Substances, Animal, Vegetable and Mineral, Solids or Fluids, simply or compounded; as has been shewn in the Two first Chapters, &c.

8. By the other vertical Section, Fig. 3. Plate 1. there is shewn a posterior View or Section of a human Body lying extended horizontally at full Length within the Bathing Vessel $B B B B$, and cover'd one half with Water, the upper Surface whereof being express'd by the dotted Line ww , which may be made cold or hot in all Degrees, and be allay'd, compounded and medicated with all Sorts of Ingredients as are of approv'd Efficacy to answer the Intention and Case, which I will suppose to be a Hemiplegia, &c. and in this Case also the Air in the upper Part of the Vessel or Receiver may be either condens'd or rarefied, and brought to act with all Degrees of Pressure; as is judg'd proper for the Intention: rp is a flexible membranous Pipe, which the Person holds in his Mouth to enable him to breathe withal, by which he is supply'd with fresh Air of any Density requir'd out of the respiring Vessel $xxxx$, according as it suits best with his respiring Organs. Moreover the Person lying thus within the Bathing Vessel, with his Body half cover'd with Water, either cold or hot, may have the other half Part, or Side of his Body, made to receive the Exercise and Benefit accruing from Vapour-Baths, humid or dry, simple or compound, by which several Ways the Motion and Distribution of the Fluids may be regulated and govern'd, and the most powerful Derivation and Revulsion be made of the same laterally, from one Side of the Body to the other, as the Symptoms and Case require, and as has been shewn before.

9. Moreover by the other Draught and Section, Fig. 8. Plate 1. an Apparatus is propos'd, whereby any particular Member or Limb, as suppose a Person's Leg and Thigh, may receive in the most perfect Manner all the Benefit that can be produc'd by Pressure and Bathing of all Sorts. For this Purpose let $B B B B$ be the Bathing Vessel or Receiver, of Copper or Cast Iron, of such a Capacity as to receive a Person's Leg and Thigh, which enters in at a round Hole upon one End of the Receiver, round the Circumference of which Hole is a Ring, projecting a small Way above the Plain of the Plate; to which Ring may be fasten'd a Piece of Leather, or an oil'd Bladder, which must be bound tight about the Member with a Fillet or Rowler, (but in this Figure neither the Projecture of the Ring, Bladder, nor Rowler, are express'd, as being readily conceiv'd without any linear Representations) to one End of the Bathing Vessel or Receiver there is join'd a short Pipe d , with a Cock thereto, the other End of which Pipe may be made to join on upon Occasion to the Barrel of the Pneumatick Engine $aa a a$, for which Purpose this End of the Pipe may be made tapering, so as to fit into a Hole in the Side of the Barrel, like to a Spiggot and Fasset: This Engine serves either for forcing Air or Water into the Receiver indifferently; $vvvv$ is a Copper Vessel for producing Vapours or Effluvia, humid or dry, from Materials of all Kinds, after the Manner as has been shewn in the two first Chapters. All Things being thus dispos'd, we may now proceed to the Operation of Bathing the Member either with some cold or hot Liquor, suppose it to be warm Water, which being heated to the Degree requir'd, (to be known by the Thermometer tt annex'd to the Receiver) in the Copper h ; upon setting open the Cock of the hot Water Pipe hp , the Receiver will become fill'd with Water, just to cover the Limb; which being done, let Air be thrown into the Receiver above the Water, by the Pneumatick Engine, until it has the Density and Pressure intended (which Degrees of Condensation may be known by the mercurial Gage Tube bb affix'd to the Receiver) suppose now the Air in the Receiver to be twice as dense as common Air, in that Case the Member inclos'd in the Receiver, whether it be a Leg, or Arm, &c. will sustain twice the Pressure that the other Leg or Arm does, that is expos'd only to the Pressure of the common external Air; and after this Manner the Pressure may be increas'd, varied, and made to operate upon the ailing Member in all Degrees and Proportions requir'd. And, on the contrary, by rarefying and exhausting the Air, either in whole or in part out of the Receiver, the Pressure may in like Manner be taken off the Member, so as to render it less in any Proportion assign'd, than what it is upon the other Limb that is expos'd only to the external Air. So that as the Pressure may be thus taken off, as well as laid on the diseas'd Member in all Degrees and Quantities, by which Method the most powerful Derivation and Revulsion may be made of the Humours to, or from the ailing Members; here I have only suppos'd the Limbs to be bath'd with simple Water, but
such

such Cases will mostly require the Bath to be compounded, and may consist of all Kinds of Fluids, either singly, or combin'd together, in all Proportions. And when the Intention is only to make a Derivation and Revulsion, the same may be perfectly effected only by the Pressure of the Air, without any other Fluid; all which is abundantly manifest from what has been said.

10. Moreover by this Receiver the Limb may be made to receive all the Benefit, which is both great and considerable, that is to be obtain'd from Vapour-Baths, humid or dry: Now to fit the Machine for humid Vaporation, the Materials may be either of the Animal, Vegetable, or Mineral Provinces, and the Fluids from which the Steam is to be produc'd may be mix'd with all Ingredients that have any Fitness and Virtue to answer the Intentions of Cure, which Materials or medicated Liquors being put into the Copper vvvv, when the Vapours are rais'd in a sufficient Quantity, upon opening the Cock of the Steam Pipe v p, the Vapours will rush into the Receiver, the Air wherein will become strongly impregnated therewith in all Degrees; but if in Case the Vapours have not Force enough of themselves to impregnate the Air in the Receiver strongly enough, then the Steam Pipe may be made to discharge the Vapours first into the Pneumatick Engine aaaa, by which it may be forc'd into the Receiver in any Quantity requir'd, and the Air at the same Time made to act with any Degree of Pressure that is proper. And by the like Process the Machine may be fitted for a dry Vapour-Bath, for Fumigation, all the Difference between this and the humid Vapour-Bath consisting only in the Materials; the former consisting of such as are capable to generate humid Exhalations, by Ebullition, &c. whereas the latter consists of such Ingredients as serve to produce dry Fumes or Effluvia by Accension, Attrition, or intense Heat, &c. and as the Steam or Vapours, either dry or humid, may be kept constantly supply'd in the Receiver, and made to act with all Degrees of Strength and Pressure upon the diseased Member, by which Means the strongest Derivation and Revulsion may be made, with the best Disposition for the Cure of many Cases, as Tumors, Gangrenes, &c.

11. There is this further considerable Advantage to be obtain'd from this Method, that whether the Member be bath'd with any Fluid, or with Vapours, that in both Cases the Fluid, or the Vapours, may be kept constantly throwing in upon the diseased Member by the Engine, and that with all Degrees of Velocity and Impulse, which Fluids or Vapours being thus collected and directed by the Engine into a Stream, and made to act and impinge by alternate Jerks and Strokes, and with all Degrees of Velocity and Impulse against the ailing Part, by the constant Stimulation and Strokes of the Fluids or Vapours upon the Part, there will be a continual Undulation, Tremor and oscillatory Motion excited and propagated throughout the whole Solids, Vessels, and Fluids, of the Member; which will contribute greatly to the Cure of many obstinate Cases, as Œdematous, Scrophulous, Scirrhus, Scorbutick, Hydropical, Venereal, Tumors, Ulcers, &c. by Attenuating, Relaxing, Contracting, Resolving, Incurtating, Stimulating, Pacifying, Attracting, Repelling, Digesting, Discussing, Deterging, Humecting, Drying, &c. which Intentions can't possibly be obtain'd so well, by letting Water fall upon the Part from a Pump, by reason the Water in this Case not having the Velocity and Momentum, as when thrown and projected by a proper Engine for that Purpose, consequently can't produce such remarkable good Effects, for want of the aforesaid necessary Properties, which are what renders this kind of Pump-Bathing of much greater Efficacy in some particular Cases, than the common Practice of Bathing. And by causing the Receiver to be apply'd to the Machines describ'd in the Fourth and Fifth Chapters, the diseased Member may be made to receive the salutary Effects arising from the particular Exercises there described.

12. The other Draught and vertical Section, Fig. 9. Plate 1. serves for to shew how a Person's Arm, by having such another proper Receiver BBBB fitted thereto, with the like Apparatus, may be made to receive the like Operation, Exercise and Benefit, that can be obtain'd from Bathing of all Sorts, in like Manner as has been describ'd in the preceding Numbers. And what relates to the Machinery and Apparatus of this Draught, the same may be collected by referring to the Description given of the like Machine, from Number 6, to 10, of the First Chapter, the similar corresponding Parts in both Draughts, being design'd and mark'd with the same Letters and Characters. And by applying this Receiver to the Machines represented by Fig. 7, 9, 10, &c. of Plate 2; the Member, or Person's Arm, &c. may be made to receive all the salutary Effects arising therefrom, as describ'd in the Fourth and Fifth Chapters, &c.

13. After what Manner the several Regions and Members of the Body will be affected, when submitted to the several Operations and Exercises describ'd in this Chapter; for that Purpose such Parts of the Body as are understood to undergo any of the said Mechanical Operations, have their external Surface design'd by two Lines, the outermost being a real Line, but the innermost a prick'd or dotted one; the Interval or Space between the said two parallel Lines, serving to exhibit how the Part or Member will be made to expand and contract, or vibrate and oscillate Inwards and Outwards alternately, &c. as hath been already shewn in other the like similar Cases, in Number 14, of Chap. 1; and Numbers 5, and 21, of Chap. 2; and in Number 43, of Chap. 3; also in Numbers 9, and 17, of Chap. 4; with Number 9, of Chap. 5, &c.

C H A P. VII.

Contains some general Observations upon the Structure, Mechanism and morbid Affections of the Stomach, with its Appendage the Intestines; shewing this primary compound Gland and Organ, the alimentary Tube, including the whole System of the chylopoietick Organs, when disorder'd or incapacitated for doing its Office duly, to be the true original Cause whence most of the capital Diseases take their first Rise and Growth, such as the Colick, Iliac Passion, Ruptures, Tympanies, Emphysemas, Consumptions, Asthmas, Dropsies, Agues, Atrophies, Apoplexies, Epilepsies, Palsies, Hydrocephalies, with the Hysterick and Hypochondriack Affections, &c. together with a new Mechanical Method for Curing and giving Relief in the above Cases, &c.

1. **P**Reviouſly to the Subject of this Chapter, I ſhall offer the following general Obſervations.

2. Firſt, That the Stomach, with its Appendage and System, the Intestines and chylopoietick Organs, being one of the primary vital Organs of the Animal Machine, the ſame when any ways diſorder'd, ſerves of itſelf as a Cauſe adequate and ſufficient for Producing and Accounting for all Sorts of Diſeaſes incident to Mankind.

3. Secondly, As all Medicines, whether exhibited internally or externally, exert their principal Force and Effects upon the Parts to which they are firſt immediately apply'd, whether they be Emeticks, Catharticks, Diureticks, Sudorificks, Alteratives, Epipastiſticks, Bathings, Frictions, Punctures, Inuſtions, &c. It follows, that all Medicines given internally, are to be conſider'd as little elſe than topical Remedies apply'd to the Stomach and Intestines, which are the firſt principal Scene wherein their Effects are chiefly diſplay'd and manifested; it being found by Experience, that the greateſt Part of the Medicines thus convey'd by the Stomach never paſs the Laſteals, or make their Way into the Habit, and come within the Stages of the Circulation, at leaſt in the Quantity and Manner as is commonly ſuppoſed and intended, ſuch as are moſt metallick and mineral Subſtances, Boles, Earths, teſtaceous Powders, &c. which however triturated and levigated by Art, remain ſtill inſoluble, and incapable of being reduc'd by the Heat and Action of the Stomach, &c. to a Degree of Tenuity fit to enter the laſteal Veſſels, and which we find Nature has wiſely provided againſt, to prevent the infinite Damages that muſt have follow'd from the Reception of ſuch foreign, extraneous, unassimulable Particles; from whence we may infer, that the principal Force and Effects of all ſuch Medicines are exerted chiefly within and upon the compound alimentary Tube; and altho' their Effects may be propagated and extend even to the remotest Organs and Glands, either by Increasing or Diminiſhing their Secretions, this may rather be aſcrib'd as a conſequential ſecondary Effect, proceeding from the neceſſary Conſent, Connection and Influence, which the Stomach and Intestines have with all the other Organs and Glands, than to any real immediate Action of the Medicines upon thoſe Glands.

4. Thirdly, As the Exhibiting ſuch Loads of nauſeous inſoluble Medicines and Alteratives, for ſo long a Time as is commonly practiſed in the Cure of both internal and external Diſorders, muſt neceſſarily tend to the untimely Deſtruction of this moſt eſſential Organ the Stomach, with its Appendage the chylopoietick Organs, by Relaxing and Spoiling their Texture, Tone, and muſcular moving Force, &c. and thereby lay a certain Foundation for all the capital Diſeaſes, which I have here aſcrib'd thereto.

5. Fourthly, From what has been obſerv'd it follows, how extremely cautious and ſparing we ought to be, not to divert and miſapply this capital Organ from its proper Office, when there appears to be no real Defects in itſelf that wants remedying; by making it to ſerve as a common Sewer or Laboratory for preparing and conveying Medicines to all Parts of the Body, by which unnatural Procedure Millions have been loſt. And if all the Intentions that can be produc'd by other Medicines adminiſter'd internally, can be effected by proper Methods of applying the mechanical Effects of Air and Water, &c. to the humane Body, and its ſeveral Parts externally: This muſt ever be allow'd as the moſt natural, ſafe, perfect, univerſal and eligible Method.

6. Having in the Second and Third Chapters ſhewn what univerſal Influence the Air has by its mechanical Effects and Operation, Firſt, upon the whole external Body; and, Secondly, upon the whole System of the Fluids, as they circulate through the Lungs: I come now for the Subject of this Chapter, to conſider a third important Operation which it hath, and that is within the whole alimentary Tube, as alſo within the Cavity of the Abdomen and Thorax, by virtue of which threefold Operation, it acquires an abſolute Dominion over the Bodies of Animals, and becomes the univerſal Cauſe and Inſtrument both of Health and Diſeaſes.

7. Having in the laſt foregoing Chapter propos'd ſome mechanical Methods of Cure, conſider'd as apply'd topically to ſome particular Regions and Parts of the Body; as a further Sequel and Continuation of that Subject, I ſhall beg Leave here to propoſe a new mechanical Method of curing or giving Relief in ſome of the moſt excruciating Diſtempers afflicting Mankind, being ſuch

such as have their Rise and Original within the alimentary Tube, such as the Colick, Iliack Passion, &c. when the same are produc'd, as they commonly are, either from too great, or too small a Quantity of Air in the Stomach and Intestines, or from too great or too small a Quantity of Air in the Cavities of the Abdomen and Thorax; by what Mechanism the above Distempers are produc'd may be thus briefly understood. The Stomach and Intestines being one continued elastick muscular Tube or Canal, only differing in respect of their Capacity, and Density of their muscular Fibres and Membranes; now this compound alimentary Tube with its absorbent capillary lacteal Vessels, being the true and real Root of the whole Body, bears the very same Relation to the Trunk and Limbs of the Body, as the Root of a Tree does to its Trunk and Branches; and the whole inner Surface of the alimentary Tube, from the Mouth to the Anus, may be really and properly consider'd as a Part of the external Surface of the Body, and upon which the Air operates with all its Properties and Qualities in like Manner as upon the other external Parts of the Body, or upon the internal Surface of the Lungs, which may also be consider'd as a proper Part of the external Surface of the Body. Now this compound alimentary Tube is kept always in some measure fill'd with the Aliment, Chyle, Fæces, and the other Fluids that are continually discharg'd thereinto, from its own proper Glands, with those of the adjacent Viscera, as the Saliva, Bile and pancreatick Juice, &c. This compound Tube is moreover kept constantly supply'd with Air, which is continually taken in along with the solid and fluid Aliment, and likewise with the Saliva each Time that it is swallowed down. The Air thus inclos'd in the alimentary Tube, with that included in the Cavities of the Abdomen and Thorax, when of a proper Quantity, is absolutely necessary to the due Performance of the Operations of this complex Organ, and the Purposes of animal Life, and that in regard first, as it contributes by its great Fluidity, Elasticity, and Motion, &c. like to an universal Menstruum or Ferment to dissolve, analyze, mix and break open the Texture and Cohesion of the Aliment, and to present and impel the Chyle when sufficiently attenuated into the Orifices of the capillary lacteal Vessels, by which it is absorb'd, attracted, and convey'd to the common Receptacle, to be diluted with the Lympha; in like Manner as the Sap is drove and forc'd into the Capillary Tubuli, in the Roots of Vegetables, by the Air assisted by the Power of Attraction, &c. Secondly, this internal Air contain'd in the alimentary Tube, as also in the Cavities of the Abdomen and Thorax, when of a just and proper Quantity, by its Elasticity and Pressure, together with the Aliment and Fæces, serves to maintain a Ballance and Equilibrium with the external Air, as also with the Spring and contractile restitutive Force of the muscular Coats of the whole compound alimentary Tube, to prevent its becoming too much contracted and collaps'd, when much emptied of Food, and to keep it always in a due Degree distended and open throughout its whole Length for the Passage of the Fæces, &c. So that this internal Air, together with the other Contents, serves as an antagonist Power to counterballance not only the Spring and muscular peristaltick Motion of this compound Organ; but likewise to counterpoise the external Air with the alternate Systole and Diastole of the Diaphragm and abdominal Muscles, the principal Use of those Muscles being to serve as auxiliary Powers to the two primary Organs of Digestion, and Respiration or Sanguification; for upon every Systole or Contraction of the Diaphragm and abdominal Muscles, the internal Air in the alimentary Tube, with that in the Cavities of the Abdomen and Thorax will become condens'd, whereupon the Tube will be made to undergo a Systole or Contraction at the same Time; by which Contraction of the Tube inwards, and Compression by the aforesaid Muscles outwards, the Chyle will be impell'd and drove forwards through the lacteal Vessels and thoracick Duct, to the Heart, by the alternate Compression of the Air both in the alimentary Tube and Cavities of the Abdomen and Thorax. And again upon every Diastole or Relaxation of the Diaphragm, and abdominal Muscles, the Compression being then taken off the alimentary Tube, the inclos'd Air in the Abdomen, Thorax, and alimentary Tube, will thereupon expand and cause the whole Tube to dilate or undergo a Diastole at the same Time; whereupon the Mouths of the Lacteals will become open, and the Chyle impell'd thereinto partly by the Power of Attraction, and also by the Pressure of the inclos'd Air, assisted by the peristaltick muscular Motion of the Tube. So that we may conceive the whole alimentary Tube, with the Air inclos'd therein, as also in the Cavities of the Abdomen and Thorax, to have an alternate successive Motion of Systole and Diastole at the very same Time with the Diaphragm and abdominal Muscles, or at the very same Time that the other principal Organ the Lungs performs its Systoles and Diastoles; whereby we see, that as both those two principal Organs are design'd for one general End and Use, the first to dissolve and comminute the Aliment, and the second to dissolve and attenuate the same further, and having also analiz'd the Blood, to assimilate both together; so both Organs have one common Motion, and keep Time exactly together. Now to the End that the Air may be retain'd in a due and proper Quantity for the Purposes and Uses aforesaid within the compound alimentary Tube, the same is for that Reason provided with two annular sphincter Muscles, one at the upper Orifice of the Stomach, and the other at the lower End of the Tube or Anus, by which two sphincter Muscles or Valves, the Air is kept closely confin'd, and only permitted to make its Escape, in Proportion as it becomes too much accumulated and rarefied, to keep it from destroying the due Equilibrium, by obstructing the muscular Action and peristaltick Motion of the alimentary Tube; so that when the Spring and muscular Force of the Tube is duly proportion'd to that of its two sphincter Muscles,

Muscles, the inclosed Air will be always kept within its due Bounds, and of a proper Quantity, as it will always be expell'd and forc'd out, whensoever it becomes too much accumulated, by the contractile Force of the Tube, either upwards, downwards, or both Ways; through the said two sphincter Muscles; to the End therefore that all the Motions and Functions of this complex alimentary Tube and chylopoietick Organs may be duly executed, there is requir'd a proper Equilibrium between those three antagonist Powers, the first is the muscular Force and Motion of the compound alimentary Tube or Gland, assisted by the Diaphragm and abdominal Muscles; the second is the muscular Motion and Force of the two sphincter Muscles; and the third is the Resistance arising from the Quantity and Pressure of the included Air and Aliment, &c. when those three Powers are duly constituted and have their respective Properties, Qualities, Quantities, Resistances and moving Forces, rightly ballanc'd, adjusted, and proportion'd to each other, all the Operations of this complex Organ or Gland the Stomach and Intestines, will be well executed; but if any one of them gains the Ascendant and becomes predominant, or has its Operation and motive Force impair'd and diminish'd, either from an original wrong Conformation of the Parts, or from accidental Errors or Irregularities in the Use of the Non-Naturals, in such Case Diseases of all Sorts may be produc'd therefrom. Thus for Example, suppose the two sphincter Muscles to be either form'd originally with a Degree of muscular Force greater than what is proper, comparatively and relatively in respect to the compound alimentary Canal, which I believe may frequently happen to be the Case, though not naturally, but only accidentally from Irregularities in Living; or secondly, suppose this compound alimentary Tube, either by long Sickness, great Evacuations, partial Palsies, or which is most frequently the Case, either by Intemperance, or long Courses of Medicines, &c. to have its Spring and muscular Force relax'd and diminish'd in a much greater Degree proportionally than the two Sphincters, in all which Cases the alimentary Tube not having Force enough to command the Opening and overcome the Resistance of either of the two sphincter Muscles or Valves, to let the Air out as often, and in such Quantities as is necessary, to preserve a due Ballance between the aforesaid Powers, the internal Air will become thereupon accumulated within the alimentary Tube in a greater Quantity than is consistent with the Health and due Exercise of that Organ; in such wise that neither the Excrements by their Weight, nor the Air by its Elasticity, for want of being duly assisted by the muscular Force and peristaltick Motion of the Tube, are able to surmount the Resistance and open to themselves a Passage by the Anus, so often, and in such Quantities, as is necessary to preserve a just Equilibrium throughout the alimentary Tube, with that of the other Powers and Resistances oppos'd thereto; whereupon the Air being confin'd and collected in too great a Quantity, and being nether able to force its Way upwards through the upper Orifice of the Stomach, nor downwards by the Sphincter Ani, becomes more and more accumulated, and being much heated and rarefied, must greatly distend the whole compound Tube, from whence it is easy to see what great and surprising Effects may be thence produc'd, such as painful Stimulation, Convulsions, Spasms, Twistings, Involutions, and Implications of the Intestines, with an Inversion of the peristaltick Motion, Iliack Passion, Colick, Tympanies, Emphisemas, Ruptures, with all the Symptoms of the hypocondriack and hysterick Affections. And by impeding the Motion of the Diaphragm, with the due Dilatation and Contraction of the Thorax (by this undue Distention and Pressure of the Stomach and Intestines, thus inflated with Air) the Operation of the Lungs being thereby likewise incumbered and obstructed, consequently all the Diseases following from an imperfect Respiration or Sanguification must be produc'd thereby, as Consumptions, Asthmas, Dropsies, Atrophies, Agues, Obstructions, Gout, &c. and likewise by the great Distention and Pressure of the Stomach and Intestines (occasion'd from this undue Quantity of rarefied Air, windy Expansion and Vapours) the Circulation of the Blood in the descending Branches of the Aorta, as also in the ascending Branches of the Cava ministring to the lower Region and Parts of the Body, will be greatly obstructed, whereby a much greater Derivation and Quantity of the Fluids will be sent through the ascending Vessels to the Head and upper Parts, whence will be produc'd Head-achs, Phrensies, Apoplexies, Vertigos, Convulsions, Hydrocephales, Peripneumonies, Quinsies, Inflammations of the Meninges, Eyes, Face, with Hemorrhages, and all the Symptoms of the hypocondriack and hysterick Affections, &c. Again, on the contrary, supposing the muscular motive Force of the compound alimentary Tube, instead of being weaker, to be comparatively and relatively stronger than what is proper to maintain a due Equilibrium and Ballance with the two sphincter Muscles; in that Case the Air will become expell'd and thrown out of the alimentary Tube oftner, and in greater Quantities, than is consistent with the regular Execution of the Functions of this complex Organ and Gland; so that there not being Air enough to keep the alimentary Tube duly distended and counterballanc'd, and to assist in the Reduction and Comminution of the Food, &c. All the Diseases of the contrary Kind and Disposition will ensue therefrom. Moreover this internal Air contain'd in the alimentary Tube, will become always necessarily affected with all the Changes that happen in the external Air or Atmosphere; and thus as the Atmosphere changes from heavy to light, or from cold to hot, this internal Air will expand, and distend the whole alimentary Tube proportionally; and on the contrary, as it changes from being light to heavy, or from hot to cold, this internal Air will become condens'd, and the whole Tube contracted proportionally; and so far all the Changes that happen in any of the other Properties and Qualities

of the Atmosphere, which will always produce the like equal Changes in the alimentary Tube, with the Air contain'd therein, &c. so that upon the whole, without running up the Account to any farther particular Detail, upon considering the various Ways that this principal complex Organ and Gland, the Stomach and Intestines, is subject to be affected, as has been thus briefly describ'd, we may conclude for certain, that the aforesaid morbid Constitutions and Affections of this complex Organ, is for ordinary the true, general, original Cause and Parent of all the aforesaid capital Diseases, &c. which have hitherto been falsely ascrib'd to other remote, imaginary, inexplicable, unintelligible Causes, &c.

8. The Observations, Facts, and Reasoning aforesaid, being allow'd for true, it is propos'd that great Relief may be obtain'd in the abovementioned Cases, by the following plain, simple, mechanical Method and Apparatus; for this Purpose let an Instrument be prepar'd like to that of Fig. 10. Plate 1. somewhat resembling a Syringe, but must be made considerably larger and wider in the Barrel; thus *BBbb*, is the Barrel about four or five Inches in the Bore, and about six or eight Inches long; which must be bored very true; *FF*, is a Forcer or Piston of Brass, turn'd to fit true to the Bore of the Barrel, and to make it to work the truer therein, it may be arm'd with Leather upon both Sides; *Fr*, are two cylindrical Iron Rods fix'd to the Forcer *FF*, and joyn'd together at their other Ends, which serve for to move the Forcer from one End of the Barrel to the other; in the Center of the Forcer, between the two Iron Rods, is a round Hole with a Valve *v*, fitted thereto, which Valve opens upon pushing the Piston or Forcer downwards to the Bottom of the Barrel *bb*, but becomes shut upon retracting the Forcer to the opposite End *BB*, upon the Bottom *bb* of the Barrel there is joyn'd a short Pipe *ap*, with a Cock thereto at *p*, the End *a* of this Pipe being design'd to be thrust into the Anus, the Diameter thereof must be regulated accordingly, and the End thereof may be made somewhat tapering and flexible to facilitate its Entrance. The Instrument being thus constructed, its Operation, Use and Application, is after this Manner; the Cock *p* being shut, upon pushing the Forcer home to the Bottom of the Barrel, all the Air will be forced thereout, through the Valve *v*, and upon drawing the Forcer back towards *BB*, there will be a Vacuum produc'd within the Barrel; which being done, let the End *a*, of the Pipe *ap*, be introduc'd through the Sphincter Ani into the Intestinum Rectum; and upon setting open the Cock, if there be any unusual improper Quantity of Air in the intestinal Tube, as the Resistance arising from the supposed too strong Constriction and muscular Force of the Sphincter, together with the Pressure of the external Air or Atmosphere, being now both wholly taken away, the windy Flatus, rarefied Air and Vapours, confin'd and accumulated in the alimentary Tube, will thereupon force their Way and rush into the Cavity of the Barrel, (carrying along with them part of the Fæces and Contents) which being now a perfect Vacuum, and empty Space, can make no Resistance to their Exit and Entrance; the Barrel being now charged with the rarefied flatulent Air, and stimulating hot Vapours, &c. then shutting the Cock *p*, let the Pipe *ap* be drawn out of the Anus, when pushing the Forcer home to the Bottom of the Barrel, all the corrupt noxious Air will become thrown out, and the Instrument be ready for another Operation, which may be thus repeated as often and as long as necessary; and according to this Method the Intestines may be readily, safely, and at any Time pump'd, purg'd, and clear'd of all such rarefied noxious Air, and hot stimulating Vapours, when too much accumulated therein; and by which the alimentary Tube is ever more or less incommoded, irregularly stimulated, twitch'd, convuls'd, compress'd and distended, and which is the true Source and Origin of many, and most of the capital Diseases, which for want of due Attention to this one self-evident Cause, have been falsely attributed to other many remote, perplex'd, hypothetical, chimerical Causes. Now as Diseases of all Sorts may be produc'd from too great an Accumulation of Air in the alimentary Tube, occasion'd from its over-relax'd State, and languid muscular Motion; so on the contrary, Diseases of all Sorts may also be produc'd from having too small a Quantity of Air in the alimentary Tube, occasion'd by its having too great a Degree of Elasticity and muscular Force; now when this latter happens to be the Case, it is easy to see how the same is to be reliev'd, by injecting Air into the Tube, with this or any other such like Instrument.

9. In consequence of the Reasons and Observations before advanc'd, it is propos'd that such Persons as are subject to be costive, from a weak, languid, muscular Force, and protrusive peristaltick Motion in the alimentary Tube, joyn'd to a disproportionate and relatively too great a muscular Force and Contraction in the Sphincter Ani, that great Relief may be obtain'd in such Case from the Use of this Instrument, especially if the Contents of the Intestines be first soften'd, by injecting some tepid warm Liquor or Vapour, and then upon applying the Instrument, the Fæces will become forced through the Pipe *ap* into the Cavity of the Barrel, there being nothing there to oppose or resist their Exit, whereas they had not Force enough by their own Weight, assisted by the weak, languid, vibrative Motion of the intestinal Tube, to open to themselves a Passage, by overcoming the Resistance of the Sphincter Muscle, supported outwardly by the Pressure of the Atmosphere, &c.

10. It is moreover propos'd, that such an Instrument being apply'd to the Anus, will serve likewise to extract and draw the rarefied Air out of the Intestines, when the same happen to fall down out of their Place, as in the Case of Ruptures, &c. in which Cases the prolaps'd Intestine

can't oftentimes be return'd, by reason of the great Tumefaction therein, which commonly is nothing else but rarefied Air or Vapour confin'd within that Part of the Intestine which is suffocated and strangled within the Orifice and Perforation through which it fell down; which rarefied Air or windy Exhalation being all exhausted by this Instrument, the prolaps'd Intestine will thereupon admit of being much more certainly, safely, and readily thrust back through the annular Orifice or other casual Apperture and Perforation, and become restor'd and replac'd, &c.

11. Moreover the Womb or Uterus by reason of its Vicinity and Connection with the compound alimentary Tube (both being inclos'd in the Cavity of the Abdomen) must therefore become necessarily and mutually affected and influenc'd by the Disorders of each other, in such wise that when the Air contain'd in the Stomach and intestinal Tube, as also in the Cavities of the Abdomen and Thorax is either of too great or too small a Quantity, the Womb with its Contents must thereupon become subject to a Pressure greater or less than what is proper and healthful thereto, from which one self-evident obvious Cause alone all or most of the Diseases and Disorders peculiar to the Fair Sex, such as the Suppression and overflowing of the Menfes, Barrenness, Abortions, difficult Births, Prolapsus of the Uterus and Anus, Chlorosis, Fluor Albus, &c. may be more naturally and rationally accounted for than from the many labour'd refin'd Systems and Hypotheses that have been devised for that Purpose, &c.

12. Moreover all the several Uses and Intentions to be obtain'd by this Instrument, as has been before propos'd only in general, may be greatly promoted and advanc'd, by supposing the Person's Body either before, or after, or at the Time of using this Instrument, to be partly inclos'd within such a Vessel as B B B B, in the like Manner as represented by Fig. 6. Plate 1. or by Fig. 7. Plate 1. and for to have his Body previously prepared by undergoing some of the several new mechanical Methods of exercising the Body by the Application of the Properties of Air or Water, &c. thereto, as has been explain'd in the several preceding Chapters, and particularly in describing the above two Draughts and Figures.

C H A P. VIII.

Contains a new mechanical Method and Apparatus for the Cure of cutaneous Distempers or external local Maladies, as Wounds, Tumors, Ulcers, Inflammations, Gangrenes, Venereal Disease, &c. by means of Air, &c. apply'd by proper Machines to the Parts affected; and made to operate thereupon with its Properties and Qualities chang'd, proportion'd and adjusted so as will suit best with the Intentions of Cure, &c.

1. **H**AVING in the two last preceding Chapters describ'd some topical local Methods of Cure, before I dismiss this Subject shall propose a new mechanical Method and Apparatus for the Cure of cutaneous Diseases, which will comprehend most of the Cases, Symptoms, and Intentions relating to Wounds, Ulcers, Tumors, Inflammations, Gangrenes, &c. And for this End I shall choose to begin with the Consideration of a modern fashionable Distemper, which being of a complex Nature, will in its several Stages and Gradations furnish us with most of the Varieties, Symptoms, and Intentions of Cure, that can happen in any of the general Cases above-mention'd, and that is a Gonorrhœa Recens, and Virulenta; or the two first reputed Stages or States of the Venereal Disease, wherein we shall meet with Inflammation, Fluxion, Venereal Wounds, (the first Stage being much like to a lacerated poison'd Wound) Ulcers, Tumors, Shankers, Warts, Buboës, Caruncles, Fungus, Phymosis, Paraphymosis, &c. Now as to the first Original or Appearance of this Distemper, I have shewn already such Enquiries to be altogether vain and trifling, and absolutely impossible to be determin'd; it being an Accident that must have always inseparably attended the immoderate unseasonable Use of this Exercise. And as to the material Cause and Manner of its Propagation, with respect to which there may be this Difference remark'd, that a Man and Woman both being perfectly sound, may notwithstanding their cohabiting inseparably together, become subject to this Disorder, from a Strain or Rupture of the Vessels, which if not timely attended to, will degenerate and terminate in an Ulcer, and proceeding gradually will produce all the true genuine Symptoms of a Gonorrhœa; that it must have been first introduc'd, and may still be so, from sound Persons conversing together is plain; unless we allow the first Pair of the humane Species to have been created with this Infirmary, and to have intail'd it upon every Individual by an indefeasible hereditary Right throughout all successive Generations; this Way however of contracting the Distemper from sound Persons, is but rarely the Case, and when timely adverted to, is no ways dangerous, being no more than a simple Wound. But the most common and dangerous Way of its Propagation, is from conversing with Persons already infected therewith, by the Attraction and Intromission of some highly putrid corrosive saline Particles deriv'd from Ulcers pre-existing in the Parts of Generation, which being receiv'd into the Pores and Intestines of the Parts, by their great Acrimony, Attraction and Stimulation quickly solicit and bring on an unusual Fluxion of the Humours to the Part affected,

attended

attended with Inflammation, Tumefaction, Rupture of the Vessels, Excoriation and Ulceration of the Parts; which in its first Period and State may in some measure be resembled to a Gun-shot Wound, or the Bite or Sting of some poisonous Animal, in which Cases all the extraneous Bodies as the Fire, Shot, Poison, &c. must be extracted before that the Wound can be disposed for to heal or re-unite; so in like Manner the first Intention in the Cure of a Gonorrhœa, is to extract those extraneous, venereal, fiery, saline Particles out of the Parts, before they can be dispos'd or brought to a State and Condition of healing, which first primary Intention will be always best obtain'd by warm emollient Fomentations and Bathings apply'd to the Part; and by bathing the whole Body pretty frequently and at proper Times in cold Water. Now with respect to the Cure of this Distemper, with all the usual Symptoms attending thereon, I will venture to affirm that by a proper Use and Application of the mechanical Properties and Qualities of the Air, with cold and hot Baths, as also Vapour-Baths with Fomentations and Fumigations, &c. apply'd to the Penis, &c. by means of proper Machines and Instruments fitted to the Parts, the same will be more safely, expeditiously and perfectly cured, than by the Use of internal Remedies, or any other Methods now in Practice; for this Purpose it is to be consider'd, that the Penis being a depending Part and endow'd with the most exquisite Sensation, whensoever any Disorders happen thereto they prove very difficult to cure, by reason of the great Fluxion and Tendency of the Humours to this Part, which frequently causes involuntary Erections in the Member, and which proves one of the greatest Impediments and Obstructions to the Cure. One main principal Intention then to be aim'd at, and upon which the Success and Expedition of the Cure greatly depends, is to prevent those involuntary Erections, by which frequent Distensions of the Parts, the same are kept from reuniting and healing, the new repullulating Fibres being at every such Time torn to Pieces, and their Inosculation and Reunion prevented, and thereby Room made for the venereal Virus and putrid saline Spiculæ to insinuate themselves further into the Parts, producing Ulcers, &c. The principal Intention then in this Case is to make a Diversion or Revulsion of the Fluids, by turning their Course and causing them to flow in less Quantity and Velocity to the Part. Now it is humbly propos'd that this Intention of causing a Revulsion of the Fluids, may be most certainly and effectually obtain'd, by having a Vessel such as abnn, (*Vide* Fig. 10. Plate 3.) which may be of Glass, Brass, &c. and of various Forms as is found most commodious. (A separate View and Section of the Vessel is shewn at Fig. 16.) one End whereof nn is open; and of such a Width as to admit the Penis easily therein, (as also the Scrotum and Testicles upon Occasion, when affected with any Disorders) the Orifice nn whereat the Penis enters, may be form'd with a flat smooth circular Ring, which may be cover'd with soft Leather to make it sit easier and closer upon the Body, so that when the Member is put into the Vessel, (which for better Distinction I shall name the Receiver) and the Orifice nn press'd close to the Os pubis, and made fast thereto, with proper Bandage apply'd round the Body; to the other End of the Receiver there is fix'd a short Pipe zp with a Cock thereto, and mp is another such Pipe which may be made to screw on either to the upper or under Side of the Receiver, as there is Occasion; which being suppos'd, the Receiver may be fill'd with any proper medicated Liquor, simple or compound, or with Decoctions, Fomentations, Infusions, Cataplasms, or with pure Air only; or with Air, that is impregnated with Effluvia or Vapours produc'd from Materials of all Sorts; properly chosen for answering any general Intention that may be indicated in the Progress of the Cure, serving either for relaxing, contracting, stimulating, resolving, dissolving, drying, humecting, digesting, incarning, cicatrizing, &c. which being done, let Air be injected either with a Syringe, or let the Pipe pz of the Receiver be join'd to the Pipe xa of the Engine aaaa, Fig. 12. by which Air may be forc'd in any Quantity into the upper Part nao, of the Receiver, which must be left empty for that Purpose. The Air in the upper Part of the Receiver being brought to a proper Degree of Condensation, by its Pressure upon the whole Body and Vessels of the Penis, like to an equable soft Bandage apply'd equally thereto, and acting with a proper Degree of Pressure thereupon; will thereby effectually restrain and cheque the Fluids from flowing so plentifully and strongly thereto; whereby the main principal Intention will be gain'd towards the Cure, so that the Part being by this Means effectually secur'd from Fluxion, with the necessary Attendants thereon, Stimulation, Pain, and involuntary Erections; and being thus restor'd and kept at Ease and Rest, the Medicines apply'd thereto will have full Liberty to do the Work requir'd of them; and Nature, which is always the best Physician, will perform the Cure.

2. Now with respect to the Process and Method of Cure in this and all other Diseases, it is to be observ'd, that the humane Body being a vascular compressible Machine compos'd of two general Powers or Principles the Solids and Fluids; the Solids, together with the Pressure of the Atmosphere, being the moving Power apply'd for circulating the Fluids, which are the other opposite Power or Resistance; so long then as the moving Force of the Solids and Air is duly proportion'd to the Resistance of the Fluids, the whole Machine will have all its Motions duly perform'd, it being impossible for the Body to become sensibly affected with any Disease; but either the whole System of the Solids, or some Part thereof must necessarily become affected, either with too great a moving Force, which is generally the Case in Fevers, and inflammatory acute Distempers, or with too small a Degree of moving Force, which proves to be the Case commonly in chronical Diseases. From whence we may draw this natural Conclusion, that as all

Diseases

Diseases consist in an unusual Change produc'd in the motive Force of the Solids, either of the whole Body; or of some one or more of its Organs being either rais'd too high, or depress'd too low, whereby the Fluids become irregularly circulated and unequally distributed to the several Parts of the Body; and from thence will follow this other Conclusion, that all the possible Means, Methods, and Intentions of Curing Diseases, may be reduc'd to this one of Regulating and Restoring the Ballance of Motion between the Solids and Fluids, which can only be done by adding or subtracting Motion to, or from the Solids, and in determining and regulating the Fluids, both as to their Quantity, Quality, and Direction, so as to keep the animal Machine in the whole, and in all its Parts, possess'd with its natural Quantity of Motion. Consequently the whole mechanical Effect of all Medicines and Methods of Healing of what Sort soever, may be referr'd to this one single Intention, of Increasing or Diminishing the Quantity of Motion in the Solids and Fluids as it is found requisite, and in Regulating the Direction and Determination of the Motion as it is wanting. From whence we are taught this fundamental Aphorism and Rule, which comprehends the whole that relates to the Practice both of Physick and Surgery, That the Cure of all Diseases or Ailments, be they of what Kind soever, consists in adding and subtracting Motion, so as to preserve the animal Machine in the Whole, and in every Part, possess'd with such a Quantity of Motion as is most natural, constitutional, and healthful thereto; and hence we learn, that the whole Efficacy of all Medicines and Methods of Healing consists in their Fitness to produce or destroy Motion, or change and alter its Direction, and consequently such as serve to answer this Intention most universally, safely and effectually, are to be esteem'd the best. It were an easy Matter to demonstrate the Truth of the aforesaid Principle, would it not occasion too long and unnecessary a Digression; by running through the several Classes of Medicines, and shewing that their whole Intention and Operation consists in the Quantity of Motion they are capable to produce or destroy, and in Changing or Regulating this Motion. And it is upon this Account that Emeticks, especially some of the rougher mercurial Kind, have hitherto been esteem'd of such great Efficacy in Venereal Cases. But as the Effects which Emeticks of any kind have in this, or any other Disorder, consists wholly in the universal great Momentum and Quantity of Motion that becomes communicated thereby to the whole System of the Solids and Fluids, with the Determination and Direction of the Motion to the central Parts of the Stomach and Intestines, by which universal Shock and Convulsion, the whole Body becomes agitated in its remotest Parts, whereby Obstructions will be remov'd, and if any extraneous noxious Particles, such as the Venereal Virus consists of, are wedg'd in and impacted into the Pores of the Solids, the same will by this universal Shock become broken, dislodg'd, and squeez'd out, whereby the Solids being freed of those putrid, saline, stimulating Particles, will coalesce and reunite, recovering their native Spring and Tone. So that all the salutary Effects produc'd by Emeticks is wholly owing to the great Quantity of Motion impress'd thereby upon the Body, and not to any specifick Virtues or occult Qualities, wherewith those and other Medicines have been thought to produce the above good Effects. However, it seems a very unnatural Method of Proceeding, especially in the first and second Stages of this Disease, and before that it has reach'd and been communicated to the Blood, for to subject the whole Body to such a violent Quantity of Motion and Exercise, purely for the Sake of Regulating the Quantity of Motion, and making a Revulsion from the Penis, which is the only Part as yet suppos'd to be disorder'd in its natural Motions, especially when the said Member may have the same, or a much greater Quantity of Motion impress'd thereon directly and independantly, without fatiguing and harrassing the whole Body for that Purpose, by which imprudent Practice it is to be fear'd more Persons have been destroy'd than by the Disease itself.

3. Now to descend to Practice, and to exemplify and illustrate the Application and Use of this new Method, grounded on the foregoing Principles and Reasoning; suppose then the Penis arm'd with its Receiver, as at Fig. 10. by means of which Instrument all Sorts of Medicines may be commodiously apply'd thereto, that are of known Efficacy to answer any Intention that may present in the Progress of the Cure, either for Relaxing, Contracting, Digesting, Incarning, Cicatrizing, &c. or which includes all the Intentions at once, that is either to increase or diminish the Quantity of Motion in the Member or Part, as it is found necessary, until it acquires its proper natural Temperament, Tone and Strength. Thus then the Penis being inclos'd in its Receiver, may be made to receive all the salutary Effects (which in this Case will surpass any other) that can be obtain'd either from a cold or hot Bath, and by Injecting the Air into the upper Space a n o, above the Surface of the Liquor, &c. in the Receiver, denoted by the prick'd Line n o, by a Syringe or other proper Engine or Instrument, such as a a a a, apply'd to the Pipe z p, the Member may be subjected to any Degree of Pressure, the same as if the Person's whole Body was immerg'd under Water from the Depth of one Foot, to that of a hundred, or a thousand Feet; if such a Quantity of Pressure could ever be requir'd; so that from the stimulating Force arising from the Coldness of the Liquid in the Receiver, together with the great Pressure that may be thus laid upon the Part in all Degrees, by the condens'd Air within the Receiver; by which Means the Penis may have a much greater Quantity of Motion and Stimulation communicated thereto, than what can possibly be done any other Means; by which uniform equable Pressure and Stimulation, thus equably apply'd to the whole System of Vessels in the

Penis, the same will be thereby put under a strong Contraction, whereby the noxious, putrid, venereal Particles, that had insinuated themselves into the Pores and Interstices of the Solids, will become attenuated and expell'd, whereupon the Parts will reunite and recover their lost Tone and Spring. Moreover this Intention of subjecting the Penis to any Degree of Pressure, may be done by having only Air in the Receiver, without any Water, and this Air may be absorb'd and impregnated with Effluvia or Vapours, either moist or dry, produc'd from proper Materials of all Sorts, which Vapours are understood to be first produc'd in a separate Vessel *v v v v*, such as that of Fig. 12. and when the Vapours are rais'd in a sufficient Quantity, upon opening the Cock of the Steam Pipe *v p*, which is understood to communicate with the Pneumatico-Hydraulic Engine *a a a a*, Fig. 12. into which the Vapours may be made first to pass, and from thence are thrown into the Receiver, so as to render the Air therein saturated therewith in all Degrees; by which Means the Member may be made to receive all the Benefit that can be obtain'd from Vapour Baths, both humid and dry, in the most advantageous Manner; which Practice of Fumigating the Part, when properly apply'd, will prove of considerable Use in some Stages, Periods, and Symptoms of the Cure. Moreover the Penis thus arm'd with its Receiver, by opening the Cock of the Pipe *p m*, and applying the End of the Pipe *z p* to the Engine *a a a a*, the Penis may have cold or hot Water, or Vapours thrown upon it successively and alternately with all Degrees of Velocity and Impulse requir'd; which Water or Vapours, by impinging thus by alternate Strokes and Jerks upon the Member, together with the Stimulation arising from its Coldness or Heat, will conduce greatly to excite an oscillatory vibrative Motion throughout the whole Substance of the Member, and thereby enable the same to shake off and expel those poisonous, putrid, venereal, saline Particles, which clog and oppress the Spring and tonic Motion of the Parts, and keep them from Reuniting, by their Stimulation, with the Fluxion and Pain consequent therefrom: Thus then we see how the Penis may independently, and of itself alone, without involving the whole Body unnecessarily in Trouble, with the Assistance of this artificial Armour or Receiver, be made to receive in the most perfect Manner all the Benefit that can be produc'd either from a cold or hot Water, or Vapour Bath, either simple or compound, but with many singular Advantages that can no ways be obtain'd from the modern Practice of applying the same; all which several Intentions, and how the same are to be attain'd, will become better understood by referring to the foregoing Chapters, &c. And by applying the Pipe *z p*, of the Receiver, to the Barrel of the Engine describ'd in the Fourth Chapter, or to that describ'd in the Fifth Chapter, the Member may be made to receive the Benefit of the new and salutary Methods of communicating Motion and Exercise to the Body, and its several Members, as may be found there more fully and particularly explain'd.

4. To illustrate after what Manner the Parts and Members of the Body will be affected, when made to undergo any of the mechanical Operations and Exercises here describ'd, &c. for that End, such Parts of the Body as are submitted to any of the said Operations and Exercises, have their external Surface defin'd by two parallel Lines, the outermost whereof being a real Line, and the innermost a prick'd Line; and the Interval between the said two Lines is intended to denote and express the Alterations and Changes which the Part or Member will be made to undergo, either by Expanding, Contracting, Vibrating, &c. as may be more fully understood by referring to Number 14, of Chap. 1; Numbers 5, and 21, Chap. 2; Number 43, Chap. 3; Numbers 9, and 17, Chap. 4. with Number 9, Chap. 5, &c.

5. Moreover in all Cases, attended with a Solution of Continuity in what Part of the Body soever, the Consequence following thereupon will be a Fluxion, or greater Derivation of the Fluids to the Part so affected, than what is proper and constitutional thereto, as is the Case in Wounds, Ulcers, Fractures, &c. Moreover, whenever the moving Force or Spring in any Part or Organ of the Body becomes overmuch relaxed, a Fluxion or greater Determination of the Fluids both in Quantity and Velocity, to the Part so affected will necessarily ensue thereupon, more than what is compatible with its healthful natural State; the Fluids becoming ever determin'd in greater Quantities, and with greater Velocity, upon those Parts that are the most depending, weakest, and least able to withstand their Force and Pressure. Now the usual Methods for Restraining and Preventing Fluxion and Hemorrhage in the Cure of Wounds, Ulcers, Tumours, &c. consists chiefly in Bandage, or other proper Contrivances made to fit and press upon the Parts, the more equally the better; but here it is to be observ'd, that the chief Excellency of Bandage being to support and sustain the Part affected, whether Wound, Ulcer, Tumor, Fracture, &c. and to keep the Medicines apply'd thereto with a sufficient Degree of Stricture and Pressure, and likewise that the Pressure be laid on equally upon the whole Part: Now this Intention can never be perfectly answer'd by any kind of Bandage with Compress and Rowlers, nor by any other Contrivance however executed and apply'd with the greatest Art and Address; which will be always found to bind and press unequally upon the Part, which Inequality of Pressure will always be accompany'd with Uneasiness, Pain, Fluxion, and symptomatick Fever, &c. more or less in Proportion. And this Observation holds more especially true with respect to the Parts of Generation, which by reason of their depending Situation, exquisite Sensation, with their peculiar, cellular, cavernous, membranous Structure, whereby they are subject to such sudden and great Degrees of Distention and Contraction; upon which Accounts it is impossible to contrive

or adapt any Bandage that shall fit easy, and act at the same Time with a constant, equal, and sufficient Pressure upon the Part, whereby this Member becomes subject to great Fluxion, with its usual Attendants, Pain, Inflammation, and involuntary Erections, which are the great Impediments that render the Cure of Disorders in this Member so tedious, troublesome, and imperfect; but now according to this new Method, of having the Genitals inclos'd in a proper Receiver for the Purpose, as before describ'd, all the ill Symptoms of Fluxion, Pain, Inflammation, involuntary Erections, will become effectually remedied, by causing Air to be injected into the Receiver, until it is sufficiently condens'd; which Air by its uniform equable Pressure upon the whole Member, will prove the most perfect of all Bandages, by reason the Parts may be thereby subjected to any Degree of Pressure and Stricture whatsoever, without receiving any Injury therefrom, by reason the Bandage or Pressure is in this Case apply'd uniformly and equally, and in all Degrees requir'd to the whole Member, by the elastick Fluid the Air, which becomes in this Case the Bandage for the Member, and of all others the most perfect, as it will dilate and contract equally as the Member does, (to which it serves and does the Office of a fluid Mould or Case) and yet may be made to act with such a Force and Pressure upon the Organs of Generation, as will be sufficient to cheque and bridle all the irregular, exorbitant Motions and involuntary Erections incident thereto, &c. So that upon the whole I will venture to promise, that this Disease, with all the Symptoms attending thereon, during its two first reputed Stages, and before that it has made its Way into the Habit, and contaminated the Fluids and Solids, may be safely, perfectly, and expeditiously cured, only by keeping the Genitals closely envelop'd and wrap'd up within such a condens'd aerial Bandage or artificial Atmosphere, made for to act with a proper Degree of Pressure thereon, and by exercising the Member at proper Times, as the Symptoms shall indicate, either with the cold or hot Water Baths, simple or compound; or with the Vapour-Baths, humid or dry; as also the Method of Pump-Bathing; together with the new Methods describ'd in the Fourth and Fifth Chapters, using now and then gentle emollient Fomentations and Fumigations; observing a temperate, light Regimen or Diet, &c.

6. It is moreover humbly propos'd, that this Method of condensing the Air within such proper recipient Vessels, and applying the Air so condens'd for to operate and press upon the several external Parts of the humane Body, will be also of great and universal Use in the Cure of Wounds, Ulcers, &c. in which Case when the Fluids are sound and healthful, could the Fluxion, with the Pain, Inflammation, and symptomatick Fever, which are Consequences ever more or less attending thereupon, be but effectually prevented, the Cure or Reunion of the Parts would become soon effected, this being entirely the Work of Nature, and brought about by the establish'd Laws of animal Mechanism, or that universal Principle of Self-Preservation and Attraction impress'd upon every Being, by the Author of all Being. And this Reunion of the divided Solids is produc'd by a successive gradual Elongation of the wounded Fibres and Vessels, from an Attraction, Assimilation, and Apposition of the nutritious Parts of the Blood to the Extremities of the divided Solids, until they come to inosculate and reunite. The Medicines, be they of what Kind soever, that are apply'd to the Parts, having in this Case no other Use than to keep the Extremities of the divided Vessels and Solids moderately warm, moist and supple, so as to keep the Vessels open and pervious, and to prevent their becoming dry'd, wither'd, collaps'd, obstructed, and callous, which would hinder their Elongation, and consequently their Reunion. By which we see the whole Business, so far as humane Art can go, in the Cure of Wounds and Ulcers, consists in managing properly what relates to Revulsion, or in Regulating the Quantity of Motion in the Fluids, and changing its Direction, by causing them to move in a less Quantity, and with less Velocity to the Part affected, than what would be proper in a natural healthful State of the Part, and before it was wounded, and in keeping the Extremities of the divided Solids duly moisten'd with some proper balsamick Liquor. Now to attain this main cardinal Intention of preventing Fluxion, or Regulating the Quantity, Direction, and Velocity of the circulating Fluids to the Parts affected, in the Case of Wounds and Ulcers, &c. the Methods which the modern Practice furnishes us with for that Purpose, is Bandage, with Compress and Rowlers; but, as has been already observ'd, no Bandage made with Compress and Rowling, though ever so well contriv'd, and apply'd with the greatest Skill and Dexterity, can ever be made for to fit so easy, and fit so well and equally to the Part, but there will arise an Inequality of Pressure therefrom, which will necessarily produce Fluxion (the very Evil intended to be remedied thereby) with the other inseperable Symptoms consequent therefrom, Pain, Uneasiness, Inflammation, and Fever, which are the principal and only Impediments to the Cure. But now according to the new Methods here propos'd, of having proper Vessels or Receivers peculiarly fitted and adapted, so as to fit close, easy and tight, to the several external Parts of the Body, and having such an Aperture and Opening, upon that Part where they join to the Body, as will be sufficient to cover and receive within it any Wound, Ulcer, Tumor, &c. as may happen in the several Parts of the Body; which Receivers being made fast to the Body with proper Bandage, let Air be injected therein until it acquires such a Degree of Condensation and Pressure, as will be equal to counterballance and restrain the circulating Fluids from oozing or weeping out at the Extremities of the divided Vessels; and in this Case the Pressure of the Air may be brought to such a Degree of Force and Exactness, as to be just equal to the

Resistance which the circulating Blood receiv'd from moving in the Vessels before their Continuity was broke or divided; so that the wounded or ulcerated Part will become thus sustain'd and supported outwardly by the Pressure of the condens'd Air, which acts with an equal Force and Pressure upon the Extremity of every single divided Vessel or Fibre, how small, or how remote soever (which is absolutely impossible to be done by any other Sort of Bandage or Contrivance) and that with a Force and Resistance equal, or greater in any Degree requir'd, than what the circulating Fluids receiv'd in moving through the said Parts, when continuous, whole, and undivided. And if the opposite Member, as suppose a Leg or Arm, is put into another Vessel, with the Air exhausted in Part, &c. by which Means the Fluxion of the Humours to the ailing Part, with the Pain, Inflammation and symptomatick Fever consequent therefrom will become remedied in the most perfect Manner; so that if the Extremities of the divided Solids are kept freed from all extraneous Bodies, and such as clog and occasion Incumbrances to the repulating renaſcent Solids, and are only kept duly supple and moistned with some soft smooth Liquor or Balsam to prevent their Drying and becoming callous, impervious and obstructed, if this Point be but taken due Care of, Nature will accomplish the Cure without any other Helps; not but that in some particular Cases, the Use and Application of the cold or hot Baths; or Pump-Bathing; as also Vapour-Baths, Fumigations, Fomentations, &c. apply'd at proper Times as the Symptoms indicate, may be of Use to promote and forward the Cure. Now in this Case as the Air is made the Bandage of the Part, there will be no Necessity for cramming the Wound or Ulcer full of Dressings, Tents, Pledgets, Stipticks, and loading and stifling the Part with Compress and Rowling over all; from which, improperly apply'd, all the ill Consequences and Symptoms attending upon Wounds, Ulcers, and Tumors do wholly proceed, as Fluxion, Pain, Inflammation, Fever, Callosity, Sinuosity, Fungosity, Extinction and Suffocation of the Natural Heat, and Circulation, with Gangrenes and Mortification, &c. The common Opinion that Air is prejudicial to Wounds or Ulcers, does not appear to be well supported, and this can only be upon Account of the Degrees of Heat and Cold that it is possess'd with, by which Qualities it may be enabled to dry and contract the Orifices and Extremities of the divided Vessels, whereby becoming totally obstructed and callous, they become incapable of Nutrition and Elongation, and as such hinders their Elongation and Reunion: But if the Air in those new Receivers or Vessels be kept of a Degree of Heat and Warmth equal to the Temperament of the Body (which it will necessarily be of, being closely confin'd in a Vessel, and having immediate Contact with the Body) and rendering the same properly impregnated with the warm tepid Vapour, rais'd from some soft, balsamick Liquor, or only keeping the Wound duly moisten'd therewith, then the above Objection and Difficulty becomes solv'd; and besides we are taught from Observation and Experience, that no such Inconveniences happen to Brutes, who though affected with Wounds and Ulcers, &c. will, though constantly expos'd to the Influence of the Air, become notwithstanding perfectly cured.

7. Moreover this Method of applying Receivers or Vessels properly adapted to the several Parts of the Body, which Receivers being fill'd with Air condens'd in all Degrees, and otherwise artificially fitted and prepar'd in respect to all its other Properties and Qualities, as will suit best with the Intentions of Cure; which Receivers being thus properly prepar'd, may be consider'd as so many artificial Atmospheres, and being apply'd and made to operate upon the several Parts of the Body, will be found of universal Use in Tumors of all Kinds, Oedematous, Inflammatory, Scirrous, Strumous, Scrophulous, Scorbutick, Venereal, &c. and that either as they will serve to answer the Intention of Repelling the Humors upon their first Appearance if judg'd safe; or for attenuating, discussing and fitting the Humors to pass off by Transpiration; or when neither of those two Intentions are proper, nor can be obtain'd, the same will serve to bring them to Digestion or Suppuration, by causing the Air to operate upon the Part with all its Properties so alter'd, combin'd and adjusted, intended and remitted, as will best suit with the Intentions of Cure. And by submitting the Tumors to the Exercise of the cold and hot Baths, with the Method of Pump-Bathing, as also to Vapour-Baths; with the new Methods of Exercise, as describ'd in the Fourth and Fifth Chapters: All which Methods may be apply'd directly and immediately to the ailing Part alone, without subjecting the whole Body to be harass'd and fatigued with endless Loads of internal Medicines, for the Sake of Regulating the undue Quantity and Direction of the Fluids only upon some particular Part; as may be readily understood from what has been said.

8. It is moreover humbly propos'd, that by this Method of having proper recipient Vessels fill'd with condens'd Air, and apply'd to the several external Parts of the Body, the same will prove of singular Use in the Cure of Hemorrhages. Now to effect this Operation, all that is requir'd is to lay such a Quantity of Pressure upon the divided Vessels, as is sufficient to counterpoize and surmount the impulsive Force and Impetus of the circulating Fluids: Now this Intention may be effectually perform'd, having first secur'd the Extremities of the divided Vessels by proper Ligature, &c. by having a proper Receiver form'd so as to fit exactly to the Part affected, and causing the Air to be injected thereinto, until it has acquir'd a Degree of Density sufficient to counterballance and restrain the Blood from issuing out at the ruptur'd Vessels, so that by this Method the Operation is wholly effected by the Pressure of the Air only, whereas

to accomplish the same Operation the modern Way, what a large Apparatus is required of Stipticks, Astringents, Corrosives, actual and potential Cauteries, arm'd Dossils and Pledgits, with Compress and Rowlers, &c. and all oftentimes to no Purpose, when the bleeding Vessels are large, or happen to lie within the deep winding Sinus's of old fistulous Ulcers, or in Anurisms that lie deep underneath the external Surface, in which Cases, and in Wounds that are deep and with an oblique Direction, none of the above Means can well be apply'd with Success; but in making use of the Air in the Manner here propos'd, such Accidents may be prevented, the Pressure of the Air extending to the Bottom of all Depths and Cavities how remote, complicated and winding soever. So that here again we have another Instance of the universal Usefulness of the Air to animal Life, Health, and the Cure of Diseases, inasmuch as it serves as the most perfect, safe, universal powerful Bandage and Stiptick of all others; the Author of Nature having appointed it to serve as an equable elastick Bandage to envelope and inclose the Bodies of Animals, without which they could not possibly live or grow, as the Vessels would become burst to Pieces by the distending Force of the rarefied Fluids. Experience teaches us farther, that by the Use of Stipticks, Corrosives, Causticks, Cauteries, with strong Compress and Bandage, many pernicious Accidents ensue therefrom, as Fluxion, Pain, Inflammation, Mortification, Fever, with perpetual and incurable Ulcers, Fistulas, &c. all which Accidents will become in a great measure remedied by effecting the Operation by means of the Air apply'd to the Part, which acting with an equable uniform sufficient Pressure upon all Parts, will be able to check the Blood from issuing out of the ruptur'd Vessels, without causing any painful Stimulus, either from the Inequality of its Pressure, or from any of its Properties or Qualities being disagreeable to the Body, such as all artificial Stipticks, Causticks, &c. necessarily are.

9. And it is moreover propos'd, that such topical Machines properly apply'd in the several Ways, as has been shewn in this and the other particular Cases in the preceding Numbers and Chapters, may be of great Service and Benefit in some Disorders incident peculiarly to the Fair Sex, such as the Uterine or menstrual Hemorrhages, either to restrain and check them when excessive, or to solicit and promote them, when either obstructed or totally suppress'd; as also in many other Disorders relating to the Uterus, with the Parts adjacent and retaining thereto, both during the Time of Pregnancy and Delivery, &c.

10. By having the Air thus condens'd in proper topical Vessels, and apply'd for the Cure of Hemorrhages, &c. in the room of Stipticks, Causticks, and Bandage with Compress and Rowlers, &c. there is this farther great Advantage, as suppose a Person to have an Hemorrhage from a large Vessel, lying deep under the Surface, either in his Neck, Arm, Thigh, or Leg; now in order to stop the Blood, the Bandage is apply'd round the whole Neck, Arm, Thigh or Leg, whereby the sound Vessels and Parts are subject to the same Pressure with those that are ruptur'd, and which alone want the Assistance of Bandage to support and sustain them. And as the Pressure is thus apply'd equally to the sound Vessels, as it is to those that are broken, and being oftentimes made very tight, whereby the sound Vessels being all greatly compress'd, the Circulation of the Blood in the Parts without the Bandage respecting the Extremities of the Body, becomes greatly interrupted thereby, producing Obstructions, Inflammations, Gangrenes, Mortifications, with a total Loss of the Member; which Accidents will become in a great measure remedied, by applying and substituting the Air in the room of such Bandage with Compress and Rowlers, &c. which may be made for to press chiefly upon the ruptur'd Vessels only, the other sound Vessels and Parts being left in a great measure at full Liberty and free from Pressure, so that the Blood will circulate therein as usual, and as if no such Accident had befallen to the Part, &c.

C H A P. IX.

New Principles for constructing the Pyrometer, for measuring the Alterations or fluxionary Increments and Decrements produc'd in the Dimensions of Bodies, by the different Degrees of Heat apply'd thereto ; with its Use and Application for regulating the Pendulums of Clocks ; as also for settling an immutable permanent Standard-Measure for the Lengths, Capacities, and Weights of Bodies (which are all still wanting) together with its Use and Application for assaying and measuring the Effects produc'd in the animal Fluids and Solids, by Heat, Cold, Humidity, Dryness, Fermentation ; and likewise for measuring the Alterations which the living humane Body undergoes in its Dimensions, from the different Degrees of Gravity, Heat, Cold, Moisture, and Dryness of the Air, or from any other Causes whatsoever, as Exercise, Rest, Sicknefs, &c.

1. **E**lementary Air, and Fire, may be conceiv'd as Menstruums to each other, the Air or Atmosphere being always perfectly saturated and impregnated with elementary Fire, Light or Heat ; from which it acquires those Qualities of being hot in different Degrees, according as this elementary Fluid the Fire happens to have a greater or less Quantity of Motion impress'd thereon, either by the Sun, &c. or as it becomes more or less concentrated, condens'd and collected by the Attraction of Bodies ; I shall not undertake here to decide that much controverted Question, whether Cold be a positive physical Being, or only a privative negative one ; as being nothing more but Heat, consider'd in respect to its several descending Degrees. However this last Opinion appears to be the best grounded, most reasonable and defensible, yet nevertheless, as the first is the most general receiv'd Opinion, I shall here suppose it to be the true one, as the Reasoning and Conclusions which I shall deduce from that Supposition will be no ways affected thereby, whether it be so, or not.

2. Elementary Air, Heat and Cold, we find by their triple combin'd Force and Action, hold an universal Empire and absolute Dominion over the whole System of terrestrial Beings, being the principal Agents and Instruments by which the Generation, Growth and Corruption of all Bodies are produc'd ; and by the continual variable Action of which three general Causes, all Bodies both solid and fluid, are kept in a constant fluxionary State with respect to their Dimensions ; which are perpetually changing, being either expanding and rarifying as the Degrees of Heat increase, or contracting and condensing as the Cold increases, or the Degrees of Heat decrease. And from hence it necessarily follows, that as yet we have no perfect Instruments for measuring and determining exactly the absolute Dimensions of Bodies, either solid or fluid ; for to that Purpose it is necessarily requir'd, as an essential Property of a perfect Measure of any Kind, that it be invariable fix'd and always permanently the same without Variation or Change in its Dimensions, for if the Instrument or Measure itself be subject to have its own Dimensions chang'd, as well as the Bodies to be examin'd and measur'd thereby, it can never be accounted an absolute perfect Measure. And this is an Imperfection to which all our most perfect Standard-Measures and Instruments of every Kind are subject to, as well such as serve for measuring of Lengths, as Standard-Feet, Yards, &c. as those which serve for measuring the Capacities of Bodies, as Standard-Pints, Quarts, Gallons, &c. and likewise those Instruments which serve for measuring Time, as Pendulums, &c. as also such as serve for finding the Weights of Bodies, as Standard-Ounces, Pounds, &c. All which Standard-Measures, Instruments, Weights, &c. being equally subject to have their Dimensions thus continually chang'd by the Influence of Heat and Cold thereupon, as well as the Bodies proposed to be measured and examined thereby, consequently can't serve to determine the like Alterations produc'd in the Dimensions of other Bodies, from the Action of the same Causes.

3. Thus it has been found by Calculation and Experiment, that the proper Length of a Pendulum for to measure Seconds of Time must be about $39\frac{1}{8}$ Inches, and this will hold nearly true in all Parts of the Earth, making proper Allowance for the Increase and Decrease of the centripetal and centrifugal Forces ; in going towards the Equator, where the centrifugal Force is the greatest, and the Force of Gravity the least, the Pendulum will require to be shortened, but in going towards the Poles, where the centrifugal Force vanishes, and the Power of Gravity being there the strongest, the Pendulum must be somewhat lengthned, and proportionally in all the other intermediate Climates. Now with respect to the Pendulum there is one very useful Problem still wanting to be resolv'd, that is, to find an Instrument whereby the true and absolute Length of a Pendulum may be actually measur'd, and that at any Time, and as often as requir'd ; as suppose it was requir'd to know how much the Pendulum is longer in the greatest Heat of Summer, than in the greatest Cold in Winter, or in any other intermediate Degrees between those two Extrems. Now I know of no Instrument which the present Practice furnishes for solving this Problem, for in order thereto, there is requir'd some permanent unalterable Instrument or Measure for to appeal to, neither will a Clock or Pendulum though ever so well adjusted, serve in this Case for a perfect Standard-Measure or Regulator, by reason of its being itself subject and susceptible of the very same Alterations, and as such can never serve to measure the like Alterations in other Bodies, from the

very same Causes, and acting alike upon both. This Phenomenon and Affection then of the Pendulum's becoming longer or shorter by the different Degrees of Heat, was not found out and discover'd by actual Measuring, or by applying any Scale or other Instrument thereto, all which Scales or Instruments, let them be made ever so exact, and of what Materials soever, yet inasmuch as they are all subject to have their Dimensions chang'd, can never serve to discover the like Changes, either in the Pendulum or any other Bodies. This Affection then of the Pendulum's lengthning and shortning, was first found out, not by applying any Measure thereto, (there being none yet found out proper for that End, for the Reasons above) but from exact Astronomical Observations, made with accurate Instruments, of the Meridian Transits of the Sun and fix'd Stars, compar'd with the Motion of a Pendulum Clock for any Time; which Observations of the coelestial Bodies in their Appulses to, and Transits over the Meridian, being compar'd with the Motion of a Clock or Pendulum kept going for any Time, furnish'd the first Occasion for finding out, and remarking this lengthning and shortning of the Pendulum, to be one principal Cause of the Inequality of its Motion, and of its not keeping equal Pace and Time with the Motion of the coelestial Bodies. And the said Astronomical Observations of the Meridian Appulses and Transits of the Sun and fix'd Stars, are as yet the most perfect Measure and Regulator for correcting and regulating the Motion of Clocks and Pendulums by.

4. There is therefore one essential Property wanting in all our Standard-Measures, both for the Lengths and Capacities of Bodies, and the same holds equally true as to Standard-Weights, namely, that they are not of the same permanent immutable Dimensions at all Times, which they ought necessarily to be, in order to their discovering what Alterations other Bodies undergo in their Dimensions and Weights. Now I humbly think that I have found a Method whereby this Imperfection and Objection may be remedied, and the Problem before propos'd, relating to the measuring the exact Quantity of the lengthning and shortning of the Pendulum be exactly solv'd and determin'd. Now to attain this End there is nothing more requir'd, than to find a proper Method whereby all Standard Measures, Instruments and Weights, &c. when once settled and adjusted, may be kept, or brought at any Time after, when wanted to be used, to be of the same absolute Dimensions which they were of, when first settled and adjusted. And for this Purpose I shall here propose some new Principles, with the Construction of an Instrument, which will serve universally for measuring all the minute Variations which Bodies of all Kinds suffer in their Dimensions from the Influence of Heat and Cold, or any other Causes whatsoever.

5. For this Purpose *Vide* Vertical Section, Fig. 1. Plate 3. which represents an Instrument compos'd of two parallel vertical Pieces or Cheeks A a, and B b, join'd together at Top and Bottom by two horizontal parallel Pieces A B, and a b, which four Pieces compose a rectangular oblong Frame; r r is a perpetual Screw, apply'd to the Pinion or Wheel u u, in the Center or Axis of which Wheel there is form'd a female Screw 2, 3, 4, 5; with a male Screw s n, adapted thereto, upon turning the Wheel u u round, the male Screw s n becomes thereby either rais'd or lower'd perpendicularly; to one End of the perpetual Screw r r, there is apply'd an Index z x, the angular Motion whereof is computed and measur'd by the Divisions and Numbers upon the Limb of the graduated circular Plate x x, fix'd to the Side B b of the Frame. Fig. 2. is another vertical Section of the same Instrument, seen with the Side B b presented and turn'd towards the Eye. And Fig. 3. is an horizontal Section or Plan of the same Instrument, as if seen and look'd upon by the Eye plac'd directly above, all the Parts of the Instrument being suppos'd pervious to the Rays of Light and perfectly transparent. Now it is propos'd that such an Instrument will serve to measure all the most minute Changes that can happen in the Dimensions of Bodies, let them be produc'd from what Causes soever, as I shall shew hereafter; but in the first Place I will suppose this Instrument to be used and apply'd as all other Instruments and Measures are, and observe what will be the Consequence. Suppose then it was requir'd with this Instrument to measure the exact Length of the Iron Rod or Bar E 2, when expos'd to the greatest natural Heat of the Air in Summer, for that Purpose let the cylindrical Bar E 2, (as mark'd by the outermost real Lines, in Fig. 1.) be plac'd vertically with its lower End 2, resting on the Foot or Stand a b, of the Instrument or Pyrometer, and exactly underneath the Point n of the Screw s n; if now the Instrument or Pyrometer be put in Motion, and the Screw turn'd round until its lower Point n, comes just into Contact with the upper End E of the Iron Rod or Essay Bar E 2, which being done let the whole Pyrometer be left in the very same Position, until the Air becomes as cold as it is in the Middle of Winter; supposing now the two Side-plates or Cheeks A a and B b, of the Pyrometer to be of Iron, and of a like Temper with the Essay Bar E 2, which is propos'd to be measur'd, in which Case upon applying the same Essay Bar E 2, to the Pyrometer, (which is suppos'd remaining in the same State as when used upon the first Essay, when the Air was suppos'd as hot as at any Time in Summer) there will be no Variation discover'd in the Dimensions of the Iron Rod or Essay Bar, even though the same be now really shorter (which Difference in the Length of the Essay Bar, when try'd in those two extream States of the Air as to the Degrees of its Heat, is express'd in the Draught by the Lines E 2, and e 2, the former by real Lines, denoting the Length and Thickness of the Essay Bar, when expos'd to an Air as hot as in Summer; and the latter by prick'd Lines, representing the Essay Bar contracted in its Length and Thickness, when expos'd to Air as cold as in Winter) for in this Case the Iron Bar upon being apply'd to the Pyrometer,

the same will fit in exactly again between the Point *n*, of the Screw *s n*, and the other Point 2, directly under it in the Foot of the Instrument, exactly in the very same Manner as it did in the first Trial and Experiment. And this serves plainly to shew the Error, Imperfection, and Deception of all common Measures and Instruments, as evidently appears from the Case of this Instrument, which however capable from its Composition and Structure of measuring the smallest fluxionary Increments and Decrements in the Dimensions of Bodies, with as great Exactness as any Instrument hitherto invented, yet we see plainly that in this Manner of using and applying it, the same will not serve to shew or measure how much this Iron Bar varies in its Dimensions, between the greatest natural Heat in Summer, and Cold in Winter; the Reason whereof is, that the Instrument or Pyrometer itself varies in its Dimensions, equally with the Essay Bar to be measur'd thereby; for the two Cheek Plates *A a*, and *B b*, of the Pyrometer, being suppos'd of Iron, and of a like Temper with the Essay Bar, the same will become equally lengthen'd and shorten'd with the Essay Bar, and the Point *n* of the Screw, will be likewise rais'd and lower'd equally therewith, in respect of the Point 2, underneath; and consequently as the Point *n* of the Screw rises and falls, or approaches and recedes to, or from the Point 2, in the very same equal Manner and Proportion, as the Essay Bar becomes longer or shorter, consequently the same can never shew whether the Iron Bar be either lengthen'd or shorten'd, nor how much; and as such can never be accounted a true Standard Measure for determining what Changes are produc'd in the Dimensions of Bodies. And if the two Sides or Cheeks *A a*, and *B b*, of the Pyrometer be suppos'd of any other Metal or Materials, as Gold, Silver, Copper, Brass, Wood, &c. in that Case the Pyrometer will shew that there has been an Alteration produc'd in the Dimensions of the Iron Bar, but at the same Time it will not shew the true Quantity of this Variation, but only the apparent relative Quantity, that is, the Difference which there is in the Alteration of the Dimensions of the Sides of the Pyrometer, compared with that of the Bodies to be measur'd thereby; which being suppos'd of different Metals and Materials, the same will become susceptible of different Dilatations and Contractions, from the same Degree of Heat apply'd thereto.

6. Having shewn that this Instrument or Pyrometer, however fitted by virtue of its Composition and Structure, for measuring the Dimensions of Bodies, with the Alterations produc'd therein, with the greatest Exactness, and consequently all other Instruments and Pyrometers of what Kind and Construction soever; are utterly incapable of measuring those small fluxionary Increments and Decrements in the Dimensions of Bodies. It remains then for to find a Remedy for this Case: Now for a Solution of this Problem, the following two simple plain Methods are propos'd, to effect which there is nothing more required, than to find a Method, whereby the Instrument or Pyrometer before described, may be so manag'd and order'd, as to be render'd at all Times, or only as often as it is wanted to be used, in the very same absolute invariable State and Condition, which End may be obtain'd by placing the Pyrometer, before that it is used for making any Experiments, all under Water, in a Vessel for that Purpose, such as *www*, Fig. 4. the Water in which Vessel must be always brought to have the same Degree of Heat; and to know when it is so, there must be a very accurate sensible Thermometer *τ τ*, plac'd therein, observing to keep the Fluid always standing rais'd up within the Tube to the very same Height and Division, or Number *D*, upon the Scale thereto annex'd; the Water being thus always brought to the same Temper and Degree of Heat, let the Pyrometer before it is to be used be always immerg'd therein, whereby all the Parts of the Pyrometer having an equal uniform Degree of Heat communicated thereto by the Water, will become thereby render'd always of the same invariable Dimensions; and consequently become endow'd and possess'd with what is the most essential Property for to constitute a true perfect Standard Measure, as is shewn by the Section, Fig. 4.

7. But whereas the Immerging the whole Instrument or Pyrometer into Water, every time before it is used, may be thought troublesome and unartful; the following Method is therefore propos'd as a more simple, neat, expeditious, perfect Method: To which Purpose it is to be observed, that to solve this Problem, there is nothing more requir'd, but to find a permanent, fix'd, immutable Point in the Pyrometer, from whence as a constant Radix and Epocha, the Motion of the Screw and Index may always in all Experiments be reckon'd for to commence, and to be computed therefrom: Thus, if the Instrument or Pyrometer can be so order'd, that the Point *n*, of the Screw *s n*, (*Vide* Fig. 1.) can be at all Times, when any Experiments are to be made therewith, set at the same absolute Distance from the Point 2, in the Foot of the Instrument, upon effecting whereof the Problem will become perfectly solv'd, and the Pyrometer be fitted for all the Purposes and Uses intended thereby; now to effect this Problem, namely, That the Point *n* of the Screw may, upon all Occasions whensoever the same is to be used, be set exactly at the very same immutable fix'd Distance from the Point 2, directly underneath in the Pedestal of the Instrument, which End and Intention can never be gain'd by applying any Scale, Instrument or Measure whatever thereto, the common Way, how accurate and exact soever, for the Reasons already assign'd; but however the same may be effected thus, by making use of a cylindrical Iron Rod *R I*, represented as standing upon the Pedestal *ab* of the Pyrometer, the upper End whereof *R* is in the same Plain with the lower Point *n* of the Screw, and consequently
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at the same Distance from the Point 2, or the Pedestal of the Instrument, as the Point n of the Screw : If now this Iron Rod R I, which may be of a cylindrical Form, and of any Thickness and Length requir'd, can be kept and render'd always, or as often as the same is to be used, of the same unalterable fix'd Length ; which being done, if the said Iron Rod be plac'd perpendicular upon the Foot of the Instrument, with its lower End 1, standing upon the Point 2, and turning the Screw s n, until the Point thereof n, comes just for to touch the upper End R, of the Iron Rod R I, upon doing which the Point n of the Screw may at all Times, and in all Experiments, be most exactly set to the same absolute immutable Distance from the Point 2, or the Pedestal a b of the Pyrometer ; now to the End that the Iron Rod R I (which I shall name the Regulator, as being always necessary for adjusting the Instrument before it is used for making any Experiments of this Kind) may upon all Occasions be render'd of the same fix'd unchangeable Length, it will be necessary for that Purpose, before it is apply'd for Regulating the Pyrometer, that it be plac'd first in a Vessel w w w w, fill'd with Water (as is shewn by the Section, Fig. 5.) the upper Surface whereof is denoted by the prick'd Line w w, with the Regulator or Iron Rod R I, wholly immerg'd therein, now the Water in this Vessel must upon all Occasions, be brought to have the same absolute Degree of Heat, and to know how to render it so, there must be a very sensible accurate Thermometer T T plac'd in the Vessel, observing to keep the Spirit or Fluid always rais'd up to the same fix'd Height and Number D, upon the Scale affix'd to the Tube, so that the cylindrical Iron Rod or Regulator R I, having by this Means the same absolute Degree of Heat communicated thereto, will become thereby render'd of the same absolute Length and Dimensions, and consequently serve as a proper Regulator for to adjust and set the Point n of the Screw, always when wanted, to the same absolute Distance from the Point 2, which is all that is requir'd to the Solution of this Problem, whereby this Instrument will become fitted for measuring with the greatest Exactness, all the aforesaid Changes in the Dimensions of all Bodies, let the same be produced from what Causes soever.

8. The Point n of the Screw, being by Means of this Regulator, in all Essays and Experiments, set exactly to one fix'd unalterable Distance from the Point 2, or from the Plain and Surface of the Pedestal a b ; and the Screw s n, before it is apply'd for measuring any Bodies, must be turn'd round, until its lower Point n is brought to stand at this absolute fix'd Distance, to be determin'd by applying or placing the Regulator R I upon the Foot of the Instrument, directly underneath the Screw, so that the Axis of the Screw and Regulator may coincide, and turning the Screw until the Point thereof n comes just into Contact with the upper End R of the Regulator ; observing when the Point of the Screw is thus adjusted and regulated, for to set the Hand or Index z x, pointing to the first beginning Number or Division upon the Limb of the graduated Plate x x : This being done, the Space describ'd and gone over by the Point of the Screw, in moving from this fix'd Point of Distance, until it comes into Contact with the Body to be essay'd or measur'd, will serve to shew and measure what Mutations the said Bodies have undergone as to their Dimensions ; and this Motion of the Screw is to be reckon'd and estimated by the Number of entire Revolutions, and Parts of Revolution describ'd by the Index x z, in moving round the Circumference of the graduated circular Plate x x, the outer Limb whereof is divided into a Number of equal Parts, more or less, as is most convenient. So that the Screw s n of the Pyrometer, being render'd thus capable of being set as often as wanted to one and the same immutable fix'd Point of Distance by means of the Regulator R I, this Instrument becomes thereby endow'd with all the requisite Properties of a most perfect, universal, Standard Measure, which consists in its being at all Times, or as often as the same is to be used, invariable and unalterable as to its own Dimensions, or in its having some fix'd unchangeable Point, from whence its Motion is always reckon'd to commence, and to be computed in all Essays and Experiments.

9. Having thus found an invariable permanent Instrument, and universal Standard Measure, I shall proceed next to exemplify the Application and Use thereof, for Measuring the small Increments and Decrements produc'd in the Dimensions of Bodies, by the different Degrees of Heat. The first Use then that I shall make of this Pyrometer, shall be for to measure the true Quantity of Expansion and Condensation produc'd in Metals by the Influence of Heat and Cold thereupon : In relation whereto it may be observ'd, that the chief Design of making such Experiments upon Metals, is with a View to find thereby a Method for Correcting and Regulating the Errors and Irregularities to which Pendulums are subject, of being lengthen'd and shorten'd according to the different Degrees of Heat in the Air ; now if the true Quantity of this Expansion in the several Metals and Fluids was exactly found, and in what Ratio or Proportion this Effect in one Metal or Fluid, differs from that of any other, a Method may from thence be found for constructing and compounding the Pendulums of Clocks, in such a Manner, as to keep it always of one immutable Length, and thereby become a perfect Chronometer and equable uniform Measure of Time. How this Problem may be effected relating to the adjusting and compounding the Pendulums of Clocks, so as to render them permanently of the same Length, and likewise how the other Inconveniencies to which Pendulums are subject, upon being carried into different Latitudes, from the different Quantities and Powers of Gravity, and the centrifugal Force,

Force, arising from the diurnal Rotation of the Earth about its Axis, may be also remedied, I have endeavoured to shew in another miscellaneous Paper relating to some Subjects in Mechanics, &c.

10. Now in order to discover the true Quantity of Expansion in Metals from the different Degrees of Heat apply'd thereto for that Purpose, *Vide* Fig. 6. Plate 3, wherein the Pyrometer before describ'd is made use of. Thus let $wwhh$, be a Vessel either of Copper, Brass, Tin, or Glass, to the upper End whereof is fix'd a Cover ww ; this Vessel being fill'd full of Water, which may be heated to any Degree, between the greatest natural or artificial Cold, and that of boiling Water; which several Degrees of Heat communicated to the Water in the Vessel may be known and exactly regulated, by having a Thermometer rr placed therein. The Water in the Vessel being brought to have the Degree of Heat intended, let a Piece of any kind of Metal e , in Form of a cylindrical Rod (and which for greater Truth and Exactness may be drawn through an Engine, such as is used for drawing of Wire, in order to give it a more regular Form) let the said cylindrical metallick Rod (which for better Distinction I shall call the Essay Bar) be put into the Vessel of Water, through the small round Hole in the Middle of the Lid or Cover ww of the Vessel, with its lower End r , resting upon the Bottom hh , whilst its upper End e , appears just coming out through the Hole in the Cover; which Hole needs be no wider than just to permit the Essay Bar e to go easily in and out thereat. Now before that the Vessel with the Essay Bar is plac'd upon the Foot ab of the Pyrometer, let the Point n of the Screw sn be set very exactly to its fix'd Standard Point of Distance from the Pedestal ab of the Pyrometer, by applying the Regulator thereto (the Manner of doing which has been shewn in the former Numbers) the Screw being thus accurately adjusted, let the Vessel of Water with the Essay Bar therein be plac'd upon the Foot of the Pyrometer, upon the two Pieces of Iron hh , for to keep the Frame of the Pyrometer from being affected by the Heat of the Vessel, which being done let the Screw sn be turn'd round, until its lower Point n comes just into Contact with the upper End e , of the Essay Bar, noting how many entire Revolutions and Parts, the Index zx describes, from the first Commencement of the Motion of the Screw, until it comes to touch the Essay Bar; this first Experiment being finish'd, let the Water in the Essay Vessel be brought to some other Degree of Heat, either greater or less than what it had at the first Operation; which being done let the Screw sn be again adjusted anew, by bringing the Point thereof n , to stand at the same absolute fix'd Distance from the Foot ab of the Pyrometer (which Adjustment of the Screw must always be done before any Operation is made therewith) then let the Vessel with the Essay Bar be set again upon the Pedestal of the Instrument, and turning the Screw as before until it comes just to touch the upper End of the Essay Bar, noting the Number of whole Revolutions, and the Parts, describ'd by the Index, as in the first Experiment; and by comparing the Motion of the Index at the first Operation, with the Motion of the same at the second, or any other Operation, the different Effects produc'd in the Dimensions of the Essay Bar, by those different Degrees of Heat apply'd thereto, will become exactly known and measur'd. And by repeating the like Operation and Process, the Experiments may be carried on as far as requir'd, and that through all Degrees of Heat, from that of boiling Water, down to that of the greatest natural or artificial Cold; in all which several descending Degrees of Heat, as the Essay Bar will become shorter and shorter, so the Screw will have the longer Space to move, before it comes into Contact with the Essay Bar; which different Quantities of Motion describ'd by the Screw and Index, being compar'd together, the different Elongations and Contractions of the Essay Bar may be exactly measured in passing through all the descending Gradations of Heat, from that which causes Water to boil, down to that which produces freezing, or even further upon Occasion. And by submitting all the several Metals to be thus essay'd, by applying the same absolute Degree of Heat thereto, which may be done this Way with the greatest Truth and Exactness by means of the Thermometer, the comparative and relative Expansion produc'd in the several Metals, by the same Degree of Heat, may be most accurately determin'd and most exactly measur'd.

11. Now with respect to this new Method of essaying and measuring the Changes that Bodies undergo in their Dimensions from the Influence of Heat and Cold; I observe that by this Method and Process I have gain'd two capital Points, and upon which alone the whole Truth and Success of all Experiments of this Kind absolutely depend; the first principal essential Point to render Experiments of this Sort of Use, consists in communicating the Heat to the Essay Bar in an equable uniform Degree, so that the whole Bar and every individual Part and Particle therein, shall have the Heat equally diffused and apply'd thereto; whereby all the several Parts and Particles, elastick or unelastick, which enter into the Composition of the Essay Bar, may exert themselves with an equal Endeavour and Effort; now Water being a fluid Body will best of all answer this Purpose of communicating Heat to Bodies in an equable uniform Manner, in all the several Degrees from that of boiling Water, down to that Degree of Heat or Cold which produces freezing, or even further, which may be done by Art. And as to this Point relating to the communicating the Heat to the Essay Bar, it is absolutely impossible for many Reasons to propose doing of that effectually and truly by any other Method, such as applying the Flame of one or more Lamps thereto, or by the Application of any solid heated Body, &c. for in all those Methods the Heat will be always directed and communicated unequally to the Essay Bar, notwithstanding all the Care

and Precaution possible; there being many Circumstances concurring in all those Methods of communicating the Heat, any one of which being wanting will render the whole Experiment precarious, uncertain and false. So that in all the Methods hitherto attempted for communicating the Heat to the Essay Bar, some Parts thereof will necessarily become more heated than others, so that all its Parts will not have an equal Endeavour to dilate and expand, which they ought all to have equally alike, in order to render the Experiment true, useful and conclusive. And it is for want of this principal Point, that all Experiments that have hitherto been made upon Metals, to find out the absolute or comparative Quantity of their Expansion, can be no ways depended on with any Certainty, nor any useful Conclusions or Rules drawn therefrom, to direct to Practice.

12. Moreover, besides the Errors and Imperfections that must necessarily follow from the Methods heretofore practised relating to the communicating Heat to the Bodies to be essay'd; the very Instrument or Pyrometer itself, though constructed in the most exquisite Manner, will be the Occasion of sundry material Errors, by reason of its being subject to have its own Dimensions chang'd by the different Degrees of Heat apply'd thereto, upon which Account, as has been already observ'd, the same can never serve to measure truly the like Changes produc'd in other Bodies from the same Cause, unless the Instrument can by some Contrivance be renderd permanently, or as often as wanted, of the same fix'd unalterable Dimensions and State. Now as the Pyrometer which I have before describ'd hath this Property of being capable to be adjusted and regulated to one and the same fix'd Point and State, whereby it has in all Operations and Experiments but one unchangeable fix'd Point, from which its Motion always commences, consequently the same becomes possess'd with what is the most essential Property and Criterion of a most perfect universal Instrument or Standard Measure, which Property no Instrument hitherto invented can lay Claim to, and therefore can't serve as a true and perfect Measure for determining the absolute or relative Changes produc'd in Bodies, by the different Degrees of Heat. And this is the second capital Point which I propose will be obtain'd from the new Method here describ'd.

13. Now in order to shew with what Exactness and Accuracy the Pyrometer here explain'd will serve to measure the Degrees of Expansion and Contraction produc'd in all Bodies, from the Effects of Heat and Cold thereupon, for which End suppose the Screw *sn*, to have four Threads in every tenth Part of an Inch, and let the dented Wheel *uu*, have twenty-five Teeth, so that for every four Revolutions of the Wheel (in the Center or Axis whereof is a female Screw) the male Screw *sn*, will advance or move the Distance of one tenth Part of an Inch, either upwards or downwards, and the perpetual Screw *rr* apply'd to the Wheel, with the Index *zx* fix'd to one End thereof, will make one hundred entire Revolutions, suppose then the circular Plate *xx* to be eight Inches Diameter, which will give about twenty-five Inches for the Circumference, if now each Inch upon the Limb of the Plate, be divided into forty equal Parts, the whole Circumference will contain one thousand such Parts, which being suppos'd; whilst the Male Screw *sn* moves only one tenth Part of an Inch, the extream Point of the Index or Hand *xz*, will have mov'd one hundred Times round the Limb of the Plate, which being divided into one thousand equal Parts, consequently if the Essay Bar becomes either lengthned or shortned only ten hundred Thousand Part of an Inch, the same will become shewn and measur'd by the Index; and if the Circumference of the Plate *xx* be suppos'd larger, and to have its Limb divided into a greater Number of equal Parts, as suppose two thousand, in that Case this Pyrometer will serve to discover and measure all Mutations that happen in the Dimensions of Bodies, to the twenty hundred thousand Part of an Inch, &c. which is a Degree of Exactness sufficient for any Purposes and Practices.

14. The Pyrometer before describ'd may be apply'd for making Experiments, either with the Screw *sn*, and Essay Bar *e i*, both plac'd perpendicular to the Horizon, as is shewn at Fig. 6. before explain'd; or the Pyrometer may be plac'd upon one Side, with the Screw and Essay Bar both parallel with the Horizon, as is shewn by Fig. 7. differing from Fig. 6. only in respect of its Position. And in this last Situation, as the Vessel *wwh h*, with the Water and Essay Bar therein, is plac'd with its Axis parallel to the Horizon, for to prevent the Water from escaping out at the Hole in the Cover of the Vessel, at which the Essay Bar is put in, and taken out of the Vessel, for that End the said Hole must be secur'd round with Leathers. Within the Vessel is plac'd a Thermometer *τ τ*, serving to measure the Degrees of Heat communicated to the Water, and by that to the Essay Bar at each Operation and Experiment, &c.

15. However Water has been here propos'd as the Medium and Vehicle for communicating Heat to the Essay Bar, in the Experiments before describ'd, nevertheless any other Fluid as Air, Oil, Mercury, &c. may be used for that Purpose; but for all Degrees of Heat, from that of boiling Water, down to that which produces Frost, Water appears to be the best suited for communicating all the several Gradations of Heat to Bodies, between those two Extrems. It is true that Oil, Mercury, or Lead, will receive and communicate a much greater Degree of Heat before they come for to boil, than what Water will, but then the gradual Encrease of Heat can't be so well ascertain'd by any of those Fluids, as Oil, &c. as it can by Water, because Oil acquiring a greater Density and Spissitude, the longer it is expos'd to the Action of Fire, the Degrees of Heat which it receives and communicates, becomes different and very unequal; wherefore all Experiments that are made to discover and measure the true Expansion of Metals, in order to establish and settle some Rules for directing to Practice, in what relates to the regulating and

correcting the Pendulums of Clocks, had much better be try'd, by having the Heat communicated to the Essay Bar, either by Means of Water, or Air.

16. Having shewn how metalick Bodies of all Kinds may have the exact Quantity of their Expansion essay'd and measur'd, when submitted and made to pass through all the Degrees of Heat that Water can communicate thereto, from that of boiling Water, to that which produces freezing; now by the same Pyrometer any metalick, or other Body, may have all the Changes that are produc'd therein by the different Degrees of Heat in the Air, as exactly shewn and measur'd, as in the other foregoing Cases, wherein the Heat was suppos'd to be communicated to the Essay Bar, by Means of Water. Now this is a Case and Problem that I don't remember ever to have known or heard of any Solution to have been given thereto, nor of any Instrument or Pyrometer hitherto invented, that is capable of shewing and measuring the true Quantity of Expansion and Condensation produced in Bodies, from the different Degrees of Heat in the Air alone; all the Pyrometers heretofore invented serving only to shew (and that too but very imperfectly, for the Reasons already alledg'd, what Changes Bodies undergo, by applying of actual Fire and Flame thereto, by solid Bodies made intensely hot; all which are Degrees of Heat much above boiling Water. But the Method for discovering and measuring the Alterations produced in Bodies by the different Degrees of Heat naturally in the Air alone, is the principal Question and Problem still wanting to be resolv'd, as being what suits best with the Intention and Design of accommodating such Experiments for rectifying the Irregularities in the Pendulums of Clocks, forasmuch as the Changes which they suffer in being lengthen'd and shorten'd proceeds from the different Degrees of Heat in the Air only. How this most useful Problem relating to the measuring the true Quantity of Expansion which Bodies undergo from the Degrees of Heat in the Air alone, may be solv'd and effected, I shall endeavour for to shew by sundry Examples following. And, in the first Place, I will shew the Method of measuring the Changes produced in metalick Bodies, when expos'd only to the Influence of the Air. For this End, *vide* vertical Section, Fig. 1. Plate 3. wherein the Essay Bar $\varepsilon 2$, is plac'd perpendicular upon the Pedestal ab of the Pyrometer, directly underneath the Screw; so that the Axis of the Screw sn , and that of the Essay Bar, become coincident, the Essay Bar being fully expos'd to the open Air; wherein let the outermost real Lines $\varepsilon 2$, represent the Dimensions which the Essay Bar is suppos'd to be of, when the Air is as hot as any Time in Summer; let now the Screw sn of the Barometer be adjusted, by applying the Regulator RI thereto (the Manner of doing which has been already shewn) which being done, let the Screw and Index be turn'd round, until the Point n of the Screw, comes just to touch the Top of the Essay Bar $\varepsilon 2$, noting the Number of whole Revolutions, with the Parts describ'd by the Index, whilst the Screw is performing this Motion and Operation: This first Trial and Experiment being finish'd, suppose now the very same Essay Bar to be expos'd to the open Air, when as cold as it is ever found to be in Winter, in which Case the Essay Bar will be contracted in all its Dimensions both in Length and Thickness, as is represented by the inner prick'd Lines $\varepsilon 2$; let now the Screw sn , be accurately adjusted, and set to the fix'd immutable Point of Distance, as in all Operations; then placing the Essay Bar directly underneath in a Line therewith, let the Screw and Index be turn'd round, until the Point n of that Screw comes just to touch the upper End e of the Essay Bar; observing the Number of whole Revolutions, with the Parts described by the Index, whilst the Screw is moving from the fix'd unalterable Standard Point of Distance, until it comes into Contact with the Essay Bar: If now the Quantity of Motion or the Space gone over by the Screw and Index in the first Experiment, be compar'd with the Motion describ'd by the Screw and Index in the second Operation and Experiment, the Difference between those two Quantities of Motion, will be the Measure, and shew the true Quantity of the Elongation or Expansion and Contraction of the Essay Bar, when expos'd to the Heat of the Air in those two extream States or Seasons of Summer and Winter. And by repeating the like Operation and Process with the Essay Bar, when expos'd to all the intermediate Degrees of Heat in the Air, the Effects produc'd thereby in the Essay Bar may in like Manner be found and measur'd, so as to shew the Difference to the ten hundred thousandth Part of an Inch, or with still further Exactness if required, as has been shewn before; and that without any Error or Possibility of Deception, for as the Screw of the Pyrometer is capable of being thus so accurately adjusted and regulated, so as to commence its Motion in all Experiments always from one and the same absolute immutable Point; this serves as an unerring Rule and Basis, like to what some certain well known Period Radix or Era in Time is, in Respect of History and Chronology, to which future Facts are referr'd and examin'd, &c.

17. The other Section, Fig. 8. Plate 3. shews how this Pyrometer may be apply'd for measuring at any Time the Changes, as to the lengthening and shortening of Pendulums, from the different Degrees of Heat in the Air alone; now in this Case the Pyrometer is shewn in an inverted Position, in Respect to what it was in the foregoing Experiments, the Screw sn being in this Case presented with its Point n directed upwards towards the Zenith; whereas in the foregoing Essays made with this Instrument, the said Point n was directed downwards towards the Nadir Point and Center of the Earth; to the upper Part of the Frame of the Instrument let there be suspended an Iron Rod or Wire cr , of the same Length as a Pendulum ought to be

be to measure Seconds of Time; *c* is the Center of Suspension, and let the prick'd Arch Line *10*, denote the Oscillations of the Pendulum; if now the Point *n* of the Screw be nicely adjusted just for to touch the under Part of the Ball of the Pendulum *p*, and supposing this to be done when the Air is as hot as ever it is observed to be in Summer; if again, when the Air is as cold as at any Time in Winter, the Point *n* of the Screw be set at the very same absolute Point of Distance from the Center of Suspension *c*, as it was upon the first Tryal and Operation, when the Air was supposed to be as hot as any Time in Summer; the Rod or Pendulum being now in this second Operation contracted, will not reach the Point of the Screw by some small Distance (as suppose the Pendulum in this second Case to vibrate along the Arch *20*. instead of *10*.) and the Motion describ'd by the Index *xz*, whilst the Screw moves from the fix'd Standard Point, until it comes just to touch the lowermost Part of the Pendulum, will serve to determine and measure the true Quantity of its Elongation and Contraction, by those two extream States of the Air as to its Heat; and by the like Process all the other intermediate Increments and Decrements in the Pendulum, from the other intermediate Degrees of Heat in the Air, may likewise be shewn and measur'd; none of which Changes in the Pendulum can be discover'd or measur'd by any other Sort of Instrument whatsoever.

18. This same Pyrometer will serve also for measuring the Alterations produc'd in the solid Parts of animal Bodies, as the Bones, Cartilages, Ligaments, Tendons, Arteries, Veins, Membranes, muscular Fibres, &c. upon their being expos'd to Air render'd possess'd with all Degrees of Gravity, Heat, Cold, Humidity, Dryness, &c. Thus in the Section, Fig. 6. Plate 3, let *er* represent a humane Bone; inclos'd in the Vessel *wwhh*, in the Middle of the Cover of the Vessel is a Hole, by which the Bone is put in, and taken out, the upper End of the Bone just appearing at the Orifice or Hole; now this Vessel may be understood to be fill'd either with pure Air, or with Air impregnated with Vapours and Effluvia of all Sorts, or the same may be fill'd with Water; or with any other Fluid or Liquor, simple and compound; and whether the Vessel be fill'd with Air alone, or with Air and any other Fluids, &c. the same may have all Degrees of Heat, &c. communicated thereto; and the Effects or Alterations that become produc'd in the Bone, by the Action and Influence of the aforesaid, and all other Causes that can be apply'd thereto, and whether they be suppos'd for to operate singly or jointly, and that in all Degrees, Proportions and Combinations, may be most exactly measur'd by this Pyrometer, according to the Methods already shewn in other the like parallel Cases.

19. Moreover in the Section Fig. 8. Plate 3, let *cp*, (which before was understood to represent a Pendulum) be now conceiv'd to be either a humane Tendon, Ligament, or a Piece of any Membrane, Artery, Vein, Intestine, or a small Bundle of muscular Fibres or Nerves, &c. which let be expos'd to the Action and Influence of Air, render'd possess'd with all Degrees, either of Gravity, Heat, Cold, Humidity, Dryness, &c. which Air may also be impregnated with Vapours and Effluvia rais'd from Bodies of all Kinds, &c. in all which several Cases, the Mutations that become produc'd in the several Parts above mention'd of the animal Body, from the mechanical Influence and Effects of any one of the above Causes, or any Number of the same, operating thereupon either singly or jointly, and that in all Degrees, Proportions, Alternations and Combinations, may be exactly shewn and measur'd; as has already been shewn in the Case of the Pendulum. And if the aforesaid Parts of the animal Body be laid to soak in any Fluid, as Water, Wine, Vinegar, Spirit of Wine, Milk, Urine, Mercury, &c. for any Space of Time, the absolute and relative Changes that become produc'd therein from the Action of those, or any other Fluids apply'd either singly or jointly thereto, may also be most exactly shewn and measur'd, in like Manner as has been already shewn in other parallel Cases. And from a Series of such Experiments thus accurately made upon the solid Parts of animal Bodies, it is propos'd that many useful Observations and general Rules may be deduc'd, by shewing what Effects either relating to Health or Diseases may be produc'd from the like Causes acting either singly or jointly upon the humane Body; and thereby direct to the proper Indications of Cure, according to the several analogous States and Circumstances of Persons. And it may be farther observ'd, in the Prosecution of the aforesaid and other the like Experiments upon the solid Parts of animal Bodies, in so far as it is done with a View to promote the Knowledge and Cure of Diseases, that it will never be necessary to submit the Parts to be essay'd to any greater or less Degree of Heat, (let what Fluid soever be made use of, whether Air, Water, Wine, Milk, &c.) above or below the greatest and least Degree of Heat, compatible with animal Life.

20. Having in the preceding Numbers shewn how the Alterations produced in Bodies by the Influence either of Heat, Cold, or any other Causes whatever, may be exactly and universally shewn and measur'd, and that with Respect to all solid Bodies animal, vegetable, metalick, &c. I come now in the next Place to exemplify the Use of this Instrument farther, by shewing how the same will serve equally for to measure the like Changes in Fluids, as to their Rarefaction and Condensation, whether produc'd by the Application of different Degrees of Heat to the same Fluid; or of the same Degree of Heat to different Fluids: The Manner of doing which may be understood by the Draught and Section, Fig. 9. Plate 3. wherein let *qqhh*, be a Vessel of Brass, Copper, Tin, or Glass, having a Cover *qq* fix'd on at Top thereof, which let be fill'd with Water, which may be made hot in all Degrees, from that which produces boiling, down

to freezing, all which several Degrees of Heat in the Water, will become known by observing the Thermometer $\tau \tau$, placed within the Vessel; in the Middle of the Cover $q q$, of this Vessel, there is a round Hole, through which the cylindrical Vessel $w w w w$ is put in, and plac'd standing within-side upon the Bottom of the Vessel $q q h h$; this Inner Vessel may be of Glass or Tin, and is to contain the Fluids to be essay'd, either Water, Wine, Milk, Urine, Oil, Blood, Chyle, Serum, Bile, Saliva, Mercury, &c. upon the upper Surface of the Fluid; mark'd by the prick'd Line $w w$, there swims a Float f , which may be a hollow Glass-bubble of a spherical or cylindrical Figure, to which there is fix'd a small Stem or Piece of streight Iron Wire $f p$, the upper Part whereof moves freely, without Confinement upwards and downwards, within a small round Hole in the Middle of the Cover $w w$, of the Essay Vessel; now as the Fluid in the said Vessel becomes more or less rarefy'd, by the different Degrees of Heat communicated thereto, by the Water in the exterior Vessel $q q h h$, the Float f , with its directing Rod or Iron Wire $f p$, will become rais'd and lower'd proportionally, which Motion or Space gone through by the directing Iron Wire of the Float, being caus'd by the Rarefaction and Condensation of the Fluid to be essay'd, and being an Effect adequate and proportional thereto, consequently the true Quantity of the Rarefaction and Condensation of the Fluid to be essay'd, may be found and measured by applying the Pyrometer thereto, by first adjusting and regulating the Screw $s n$, (the Manner of doing which has been shewn already) and then causing the same with the Index $x z$, to move round until the Point n of the Screw, comes just for to touch the upper End p of the Rod or Stem of the Float; and the Revolutions and Parts describ'd by the Index in performing that Operation and Motion, will shew and measure the Quantity of Rarefaction produc'd in the Fluid, by applying such a Degree of Heat thereto: And thus the same Fluid may be submitted to all the several Degrees of Heat, from that of boiling Water, down to that which produces freezing; and the several Degrees of Rarefaction, consequent from such Degrees of Heat, become measur'd in like Manner, whereby the absolute and comparative Degrees of Rarefaction and Condensation in all Sorts of Fluids may be measur'd, &c.

21. As this Pyrometer will serve, as has been shewn, for making many useful Experiments upon the animal Solids, so in like Manner the same may be apply'd for making many luciferous Experiments upon the animal Fluids, from whence many useful Observations and Rules may be deriv'd to direct to Practice in the Cure of Diseases, as also for discovering the comparative relative Forces of the Solids and Fluids, with Regard to the Relaxation and Contraction of the Solids, and the Rarefaction and Condensation of the Fluids, the Knowledge of both which relative States of the Solids and Fluids is of the greatest Importance to a Physician, and may with a good Degree of Certainty be judg'd of and determin'd, from a regular Series of such Experiments, made with such an Instrument, and carefully register'd for future Observation and Practice. And after this Manner all the animal Fluids, as the Blood, Serum, Chyle, Urine, Saliva, Bile, Pancreatick Juice, &c. may have their absolute and relative Expansion and Condensation examin'd and measur'd, when submitted to all Degrees of Heat: And in like Manner may be measur'd the relative Rarefactions produc'd by Fermentation, or mixing either solid or fluid Medicines, with the Blood alone, or with any of the above Fluids separated therefrom. And it is farther propos'd, that many curious useful Experiments may be made this Way, by mixing of Poisons or deleterious Substances, either animal, vegetable, or mineral, with the Blood, &c. such as the Poison of the Viper or of a mad Dog, &c. observing and examining with this Instrument what Changes have been produc'd therein, respecting the Rarefaction and Condensation thereof, &c. from which and the like Experiments many useful Observations may be deriv'd to direct to Practice.

22. It may be farther remark'd, that in order to discover with greater Certainty and Truth the relative Expansion of different Fluids, it will be necessary that they be all try'd in one and the same Essay Vessel, for in using different Vessels the same may vary considerably in the Diameters of their Bores or Capacities, and in the Thickness of the Glass or Metal whereof they are made, on both which Accounts the same Degree of Heat can't be communicated alike, nor produce the same or like Effects upon the Fluids to be essay'd therein: And moreover, as the Atmosphere produces different Effects upon Bodies, not only by the different Degrees of Heat and Cold therein, but likewise in Respect to the different Degrees of its Gravity, Humidity, &c. Now as the Gravity, Heat, and Humidity of the Atmosphere, are distinct Properties, Qualities and Causes, each of which produce separate Effects proportional to itself, and independently of each other; wherefore in all Experiments and Operations where there is a conjunct Action of all those distinct Causes, namely, the Gravity, Heat, and Humidity of the Air, and more especially in all the Experiments propos'd in the foregoing Numbers, relating to the animal Solids and Fluids, besides having a Thermometer to measure the Degrees of Heat in the Air, or any other Fluid, at the Time of making the Experiment; it will be requisite likewise to have a Barometer for to estimate the State of the Atmosphere as to its Gravity: as also a Hygrometer, to shew the Quantity of aqueous Vapours or Humidity residing therein, &c.

23. The animal Machine consisting of two general Principles, the Solids and Fluids, which when duly proportion'd to each other, and having their moving Forces, Quantities and Qualities relatively well constituted, so as to produce a just Equilibrium between the moving Force of the

Solids, and the Re-action or Resistance of the Fluids, Health will ensue as the necessary Consequence of such a State; but whenever this Balance between the said two Powers becomes alter'd, by the one's prevailing over the other, Diseases of all Kinds will thence arise. Thus a moderate Degree of Heat acting with a grateful Stimulus upon the sensitive Organs, tends greatly to relax the Solids, and at the same time by rarefying the Fluids, gives the latter an Advantage and Prevalence over the former; whereas Cold acting as a dolorifick disagreeable Stimulus, contracts the Solids, and condenses the Fluids, whereupon the Solids in their Turn gain an Advantage and Prevalence over the Fluids: And thus by the variable Degrees of Heat and Cold, the Equilibrium between the Solids and Fluids, becomes constantly chang'd from one Side to the other: And as those Changes in the Gravity, Heat, and Cold of the Atmosphere, are kept nearly equal and upon a Par, considering one Season of the Year with another; so that in descending gradually from Summer to Winter, or from Day to Night; and in ascending from Winter to Summer, or from Night to Day; the Balance, as to the Effects produc'd by Heat and Cold, &c. is kept pretty near equal and upon a Level; for as in Summer, or in the Day-time, the Fluids being much heated and rarefy'd, have thereby an Advantage over the Solids, which are then more relax'd, by the prevailing Heat of the Air and expansive Force of the Fluids; so on the other Hand in the Winter Season and at Night, the Solids being contracted by the Cold or diminish'd Degree of Heat in the Air, and the Fluids becoming by the same Cause more condens'd, in which Case the Balance becomes chang'd in Favour of the Solids, which now in their Turn gain an Ascendant and Prevalence over the Fluids; and thus alternately and successively during the Life of the Animal, this Equilibrium between those two Antagonist Powers, the animal Solids and Fluids, is kept in a continual changeable State, by the variable Degrees of Gravity, Heat, and Cold in the Atmosphere; the Balance inclining sometimes in Favour of the Solids, and at other Times in Favour of the Fluids, and that pretty equally and alike.

24. Allowing the general Reasoning and Observations foregoing to be true, it is thereupon propos'd, that if a Method can be found for measuring the Alterations which the humane Body is subject to from the Influence of the aforesaid general Causes, very certain Indications and general Diagnosticks may be thence deriv'd, for judging of the relative comparative Force and State of the Solids and Fluids, and to know to which Side the Balance seems to lean, and whether the Solids have the Ascendant over the Fluids, or the Fluids over the Solids, either one or the other being the Case in all Diseases; and is therefore the primary Point to be first regarded and known, in order to judge rightly of the Indications, with the Regimen and proper Method of Cure.

25. Having already shewn how the Effects produc'd by applying different Degrees of Heat, Cold, Moisture, &c. to the animal Solids and Fluids, when taken out of the Body; and submitted to be essay'd separately, may be exactly found and measur'd; I come now in the next Place to shew how the same Instrument, with some Additions thereto, will serve to discover and measure with equal Exactness, all the fluxionary Alterations which the living humane Body undergoes, in its Dimensions from the variable Gravity and Heat of the Air. For this End *vide* Draughts, Fig. 14. and Fig. 15. Plate 3. wherein the humane Body is represented as standing in an erect Posture, within a Frame *c f d p*, which may be all of Iron, consisting of two horizontal Pieces, one at Top, *c f*, and the other *p d*, at Bottom; which serves for the Foot or Stand of the Frame; those two horizontal Pieces are join'd together by two vertical Pieces, *c p*, and *f d*; in the Middle of which last Piece there is a Slit lengthwise, within which Slit or Groove the Pyrometer is fitted to slide up and down by Means of a Dove-Tail, the Screw *s n*, passing through the Slit or Channel. *a a b b*, is the Pyrometer, constructed like to that of Fig. 1. Plate 3. already describ'd; which Pyrometer by causing the same to slide up or down within the Groove, the same may be brought to bear with the End *n*, of the Screw directed pointing against any Part of the Body, from the Head to the Foot, and that either to the fore or back Part of the Body, or to either Side as requir'd; the Pyrometer being thus apply'd and properly directed to the Part of the Body to be measur'd, may be fasten'd to the Side of the Frame with Screws, in which Case it will serve to measure all the Alterations in the Dimensions of any Part of the Body, let the same proceed from what Causes soever, whether from the changeable Gravity, Heat, Cold, Humidity, Dryness, &c. of the Atmosphere; or from the Influence of some Disease, as Fever, Dropsy, &c. The Pyrometer being apply'd to the Side of the Frame as in Fig. 14. serves to measure the Alterations in all Parts of the Body consider'd laterally, or as the Body becomes either dilated or contracted transversely in Respect of its Axis; but when it is intended to measure what Alterations the Body undergoes as to the lengthening and shortening of the Axis of the whole Body, in that Case the Pyrometer must be taken off from the Side of the Frame of Fig. 14. and fix'd upon the Top of the same Frame as is shewn by Fig. 15. the Screw *s n*, passing through a Hole in the Top-piece *c f*, and directed with its End *n* directly over the Crown of the Head, so that the Axis of the Body, and Screw, become co-incident. The Pyrometer thus apply'd will measure with the greatest Exactness all the Mutations, as to the lengthening and shortening of the Axis of the Body. Suppose then a Person wanted to measure what Alterations his Body underwent as to its Dimensions consider'd laterally, at one Period

Period of Time, to be compared with what they are at any other Time ; as suppose in Spring, Summer, Autumn, and Winter ; or Morning, Noon, and Night ; or in what Manner his Body is affected by the changeable States of the Atmosphere, as to its Gravity, Heat, Cold, Humidity, &c. for that Purpose let the Pyrometer be fix'd to the Side of the Frame of Fig. 14. which being done, let the Screw s n be carefully adjusted, by setting the Point n of the Screw, always in every Operation and Experiment, at one and the same absolute Distance from the Inside of the opposite Cheek or Side c p of the Frame, by applying a proper Regulator thereto, the Method of doing which has been already shewn ; the Screw being thus regulated, let the Person present his Body standing upright within the Frame of the Machine ; suppose now he wanted to know or measure the Dimensions of that Part of the Trunk of his Body lying over the Region of the Stomach, either before eating, or entering upon any Kind of Exercise, as bathing, walking, riding, vomiting, purging, bleeding, &c. or during the Remission or Intermission of any urging Symptom or Paroxysm of any Distemper, Agues, Cholic, Iliac Passion, Hypochondriac and Hysterical Affections, &c. For that Purpose having fix'd the Pyrometer to the Frame with the Point n of the Screw, directed to the Region of the Stomach, and having previously regulated the Screw as before describ'd, let the Screw and Index x z, be turn'd round, until the End n of the Screw comes just for to touch his Body, (and for greater Exactness he may make a small Mark with a black Silk Patch, upon that very Part of his Body where the End of the Screw touches, to the End that in any future Trial he may be more certainly directed, to bring the Point of the Screw to the very same Point of his Body again) then let the Number of Revolutions with the Parts describ'd by the Index, whilst the Screw is moving from the fix'd Standard Point of Distance, until it comes into Contact with his Body, be carefully noted and register'd, after the Operation. If now the same Person wanted to know or measure the same Part of his Body at any other Time, either in Spring, Summer, Autumn, Winter, Morning, Noon, or Night ; or after eating, or leaving off Exercise of any Kind, as bathing, walking, riding, vomiting, purging, bleeding, &c. or during the Continuance of any Symptom or Paroxysm of a Distemper, as in the Height of a Fever, Cholic, Hypochondriac Disorders, &c. having for that End first of all carefully adjusted the Screw of the Pyrometer as before explain'd, let the Person present his Body again in the very same Attitude and erect Posture within the Frame of the Instrument as at the first Experiment, with the Screw directed against the very same Point of his Body as at first ; then let the same with the Index be put in Motion, until the End of the Screw comes just to touch his Body in the very same Part as in the first Trial, noting the Number of Revolutions, with the Parts, gone over by the Index. If now the Motion of the Index at the first Operation, be compar'd with its Motion in the second ; the Difference in the said two Quantities of Motion, will serve to shew and measure what Difference there is in the Dimensions of that Part of the Body, at the Times of making those Experiments. And by the like Process and Operation the lateral Dimensions of any other Part of the Body may be measur'd at any Time, by setting the Pyrometer higher up or lower down, so that the Axis of the Screw s n, may be understood to be at the several prick'd Lines, 11, 22, 33, 44, &c. Suppose again, the same Person wanted to know or measure the exact Height of his Body, either in the Spring, Summer, Autumn, Winter, Morning, Noon, or Night ; or either before his entering upon any Kind of Exercise, or after leaving the same off ; or upon any Change that the Atmosphere may undergo as to any of its Properties or Qualities ; for this Purpose the Pyrometer must be fix'd upon the Top of the Frame, as at Fig. 15. and having adjusted the Screw, by setting the Point thereof n, always to one absolute invariable Distance from the upper Surface of the Foot or Pedestal d p of the Frame (by applying a proper Regulator thereto, as has been already shewn) the Screw being thus regulated, and the Person standing within the Frame with his Body full erect, let the Screw and Index be turn'd round, until its lower End comes just to touch the Crown of his Head, noting the Number of whole Revolutions, with the Parts gone over by the Index, whilst the Screw is moving from the fix'd Standard Distance, until it comes to touch his Head ; and this will shew the true Measure of the Height or Length of his Body for this present Time and Operation : And by repeating the like Operation at any other Time or Case, upon comparing the Quantities of Motion describ'd by the Index at each Operation, the Differences in the said Motions will shew and measure the Increments or Decrements that happen in the Height or Length of his Body, and shew whether the Body has gain'd or lost in its Height or Length, and how much, &c. And after this Manner may the Dimensions of the Body in all its Parts be most exactly measur'd, let the Causes that produce those Alterations therein be what they will, whether from the Properties or Qualities of the Air, or from Exercise or Rest, or any morbid State of the Solids and Fluids, or Mal-Regimen as to the Use of the Non-naturals, &c.

26. Now with Respect to this Practice of measuring the humane Body, it is humbly propos'd, that sundry useful general Indications and practical Rules may be deduc'd therefrom, to direct what Regimen a Person ought to pursue in Respect to Exercise and Rest, Aliment, Air, Retention, Evacuation, &c. Thus for Example, suppose a Person, enjoying a confirm'd State of Health for some Time, let him at such a particular Time when he finds himself in the most perfect Plight and Vigour both of Body and Mind, take the exact Measure and Dimensions of the

the principal Parts of his Body with this Instrument, noting carefully the Temper of his Body, as also of the Atmosphere as to the Degree of Heat in both at that very Time, which he may know with a Thermometer ; let him also at the same Time note the State of the Air, both as to its Gravity, and Humidity ; the first whereof he may learn by a Barometer, and the second by a Hygroscope ; and let the Dimensions which the Body is found to have at this particular Time (the Dimensions being taken both in Length and Thickness in all the principal Regions and Parts of the Body, as the Head, Trunk, and Limbs) be carefully register'd, noting the particular Degree of Heat in the Person's Body, with the Gravity, Heat, and Moisture in the Air, &c. Now as the Person in this Case is suppos'd to be in a State of perfect Health, and that for some considerable Time, and the Person's Body being measur'd at such a Time as he finds himself enjoying the greatest Freedom, Strength and Vigour, for performing all Operations both of his intellectual and corporeal Faculties ; the Dimensions which his Body is found to be of in this Case, and at this particular Time, I shall call the Standard Measure or Criterion of perfect Health, with Respect to this particular Person ; and as often as the said Person upon measuring of himself finds his Body to recede and differ from this Standard healthful Measure, either with Respect to the Bulk or Dimensions of his Body, or as to the Heat thereof, he will as often and necessarily find a proportional Alteration produc'd in his intellectual and animal Powers. And consequently such an Instrument whereby to take the exact Dimensions of the principal Parts of the Body at proper Times, will serve as a very good Monitor to give timely and early Notice, by discovering the first Beginnings of such approaching Changes in the animal System, before they become too far advanc'd and confirm'd, and break out into an actual Disease ; just in like Manner as a Barometer, Thermometer, and Hygrometer, &c. serve to give previous Notice of the approaching Alterations and Storms that are a gathering and forming in the Atmosphere, before they come to be actually felt and produc'd. Now to exemplify and illustrate this Reasoning and Practice a little farther ; suppose then the Person refer'd to in the foregoing Case, upon measuring himself with this Instrument at any Time afterwards, finds that his Body will not pass within the Instrument, when set and adjusted to the Standard Gage Measure of his healthful State, as found settled and register'd before, from whence he will become furnish'd with the following certain Observations and Facts, namely, that his Body is increas'd in Bulk and Dimensions, above what it ought to be, compar'd with his Standard Measure of Health, taken and register'd as above directed ; let him next examine the State and Temper of his Body, as also of the Atmosphere, as to the Degrees of Heat in both, with the very same Thermometer which he made use of before, observing also the State of the Air as to its Gravity, and Humidity, with the same Barometer and Hygrometer which he used at first settling of the Standard Measure for his Health ; being furnish'd with those certain Facts and Experiments, suppose then that he finds the Heat of his Body, as also the Gravity, Heat, and Humidity of the Atmosphere, to be the very same, or nearly so, as they were at the Time of settling and adjusting the Standard Gage and Measure of his healthful State (of all which Particulars he will be inform'd from his Register or Journal) and being now furnish'd with those Facts and Observations, he may proceed to Reason, and draw the following probable practical Conclusions and Indications therefrom, namely, that finding his Body to be thus sensibly augmented in Bulk and Dimensions, and all other Causes and Circumstances, such as the Heat of his own Body, as also of the Air, together with its Gravity and Moisture equal, or nearly so, with what they were at the Time when the Standard Measure of his Health was taken and register'd ; from whence he may reasonably conclude, that this Increase and Augmentation in the Bulk and Dimensions of his Body, must probably be the Effect of a real Plethora, Repletion, or Retention of some Matter that ought to have been discharg'd by some of the Secretions, either by Urine, Perspiration, &c. But if the Gravity and Cold of the Atmosphere should be found considerably greater, than at the Time of settling his healthful Standard Measure, there is Reason then to conclude farther, that in this Case the Quantity of Matter retain'd and accumulated, whereby the Bulk of his Body is thus increas'd, is much greater than what there was Room to judge it to be in the Case before, and that from the joint Action of those two other Causes, namely, a greater Degree of Gravity, and Cold in the Atmosphere, both which Causes tend to condense and contract the Dimensions of the Body. But if in Case he finds the Heat of his Body to be now considerably greater, than at the Time of settling his healthful Standard Measure, then there is reason to conclude, that this increased Bulk of his Body is not altogether owing to a real Quantity of Matter retain'd unduly in the Body, that ought to have been discharg'd, but that the same may reasonably be produc'd as an Effect rather of the Rarefaction of the Fluids, and an Expansion of the whole Body from this increas'd Degree of Heat now observ'd in his Body ; and should the Gravity of the Air happen to be at this Time less, and its Heat and Humidity both greater than at the Time of adjusting his healthful Standard Measure, now as the three last States of the Atmosphere tend all to relax the Solids, and thereby render them less capable to withstand and resist the distending Force of the circulating rarefy'd Fluids ; all which distinct Causes consider'd as co-operating with one Tendency, together with the increas'd Heat of the Person's Body, will afford reasonable Grounds to conclude, that this augmented Bulk of the Person's Body is chiefly owing to a Relaxation of the Solids, and a Rarefaction of the Fluids, produc'd by the joint Action of the abovesaid Causes,

Causes, all which contributing to unbend and relax the Solids, which must thereupon give Way and yield to the expansive Force of the rarefying heated Fluids, whereupon the Person's Body may become augmented, and not altogether from a real Plethora or Accumulation of Matter, that ought to have been discern'd, as was suggested to have been the Cause, from the first Circumstances and Stating of the Case, &c. And again on the contrary, supposing the same Person upon measuring his Body at any other Time, instead of finding his Body to exceed, finds the same to fall short of the Dimensions which it ought to have, compar'd with his healthful Standard Measure; which Difference and Effect when duly weigh'd and compar'd with the State of the Person's Body at this Time, together with the Gravity and Humidity of the Air, may furnish very good Observations, which when duly compared together, will serve to discover what are the true Causes of such Diminution in the Dimensions of the Body, at this Time, and whether the same be owing to any increas'd Secretion, or to any Contraction and Condensation of the Solids and Fluids, from the increas'd Gravity, Cold and Dryness, &c. of the Air, or any of the other Non-naturals; from all which Experiments, Facts and Observations, proper Indications may be deduc'd, directing what Regimen and Measures to pursue, in order to restore the Equilibrium and Balance of Health, and bring the Person's Body to agree as near as may be with his healthful Standard Measure, observing in all such Experiments, to make proper Allowance for the natural Increase of the Body, whilst in a growing State, and ascending towards the Meridian of Life, as also for the natural Waste and Decays of the Body, in the other descending or declining Part of Life, &c.

27. Moreover in all Affections and Diseases affecting the Head and Brain, as the Hydrocephale, Apoplexy, Epilepsy, Lunacy, Vertigo, Cephalalgia, Megrim, Mania, Palsy, &c. in which several Cases it is reasonable to think, that the Sutures, as well as the Substance of the Brain and Cranium must become sensibly affected and alter'd, by becoming either relax'd and dilated, or contracted beyond what they are in their natural healthful State and Standard Measure, whereby the Dimensions of the Cranium or Head will in a healthy State be found very different from what it is when affected with any of the above or like Diseases. Wherefore it is propos'd, that by taking the Dimensions of the Head or Cranium, of a Person laterally, as also before and behind when in a State of perfect Health with the Instrument as before describ'd, and comparing the same with the Dimensions of his Head and Cranium when under the Influence and Dominion of any of the aforesaid Distempers, or others of a like Kind retaining to the Region of the Head and Brain, that there will be a considerable Difference found, from whence may be drawn proper Indications and Observations, both to form a more certain Judgment concerning the original Causes, with the best Method of curing such Diseases.

28. By this Method of submitting the humane Body to an actual Mensuration at any Time with this Instrument, together with the joint Assistance of a Barometer, Thermometer and Hygrometer, it is propos'd, that a much more certain Judgment may be made of the State of the Body, as to the relative comparative Forces of the Solids and Fluids, and much truer Indications, Diagnosticks and Prognosticks deduced therefrom, than what can be obtain'd from the Use of the once famous sanctorian statical weighing Chair, which Machine is in sundry Respects very fallacious and deceitful, and therefore its Testimony with the Indications and Computations that have been grounded thereon not to be absolutely rely'd on, as might be easily shewn.

29. Moreover, this Pyrometer having a convenient Apparatus, properly accommodated and apply'd thereto, will serve as the most perfect and accurate Barometer, Thermometer, and Hygrometer, &c.

F I N I S.



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Fig. 5

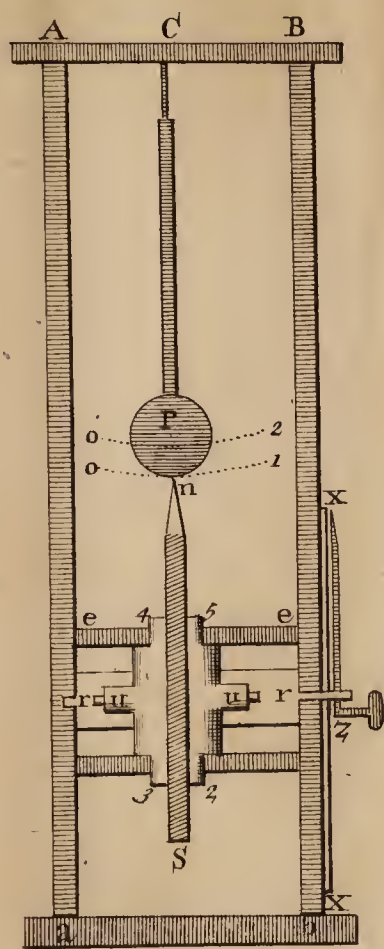
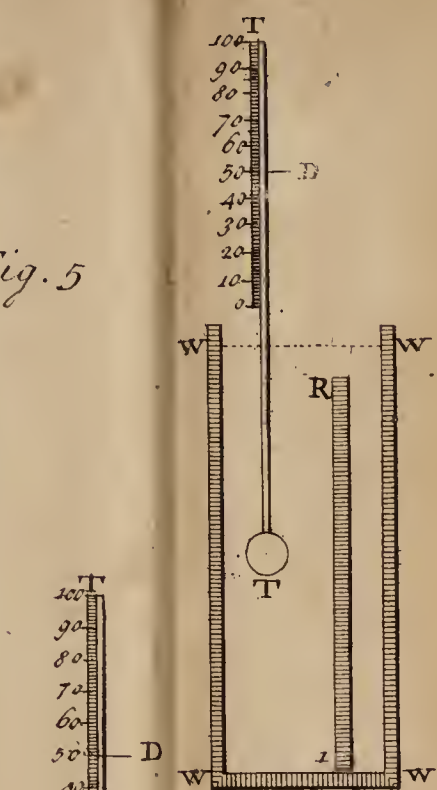


Fig. 8

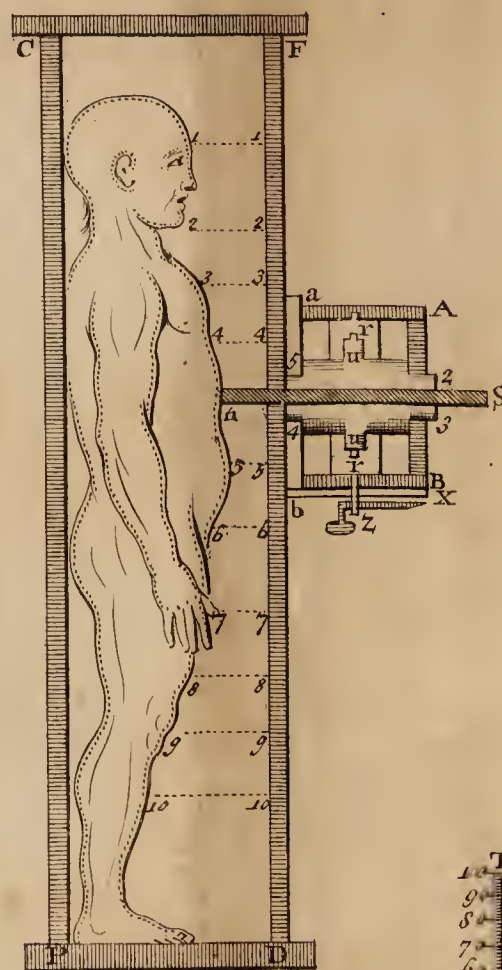


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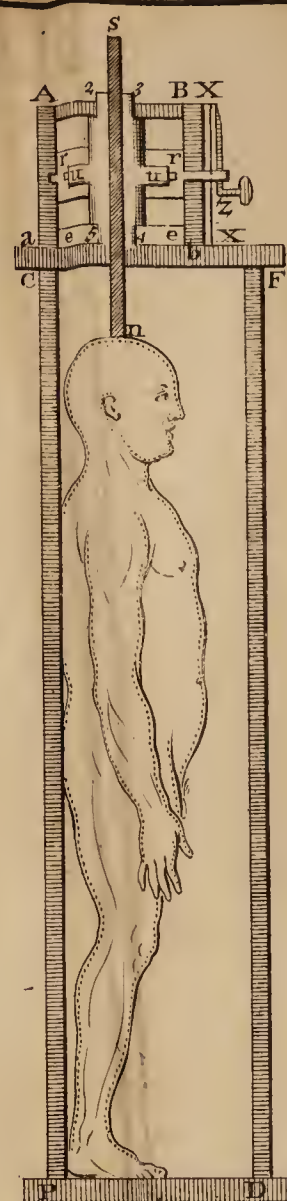


Fig. 15

Fig. 4

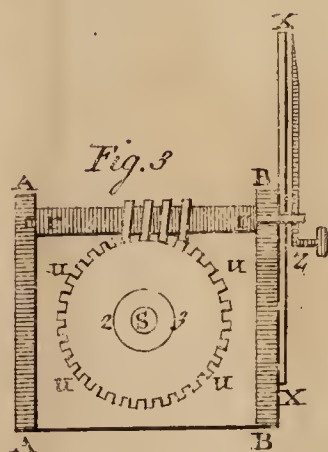
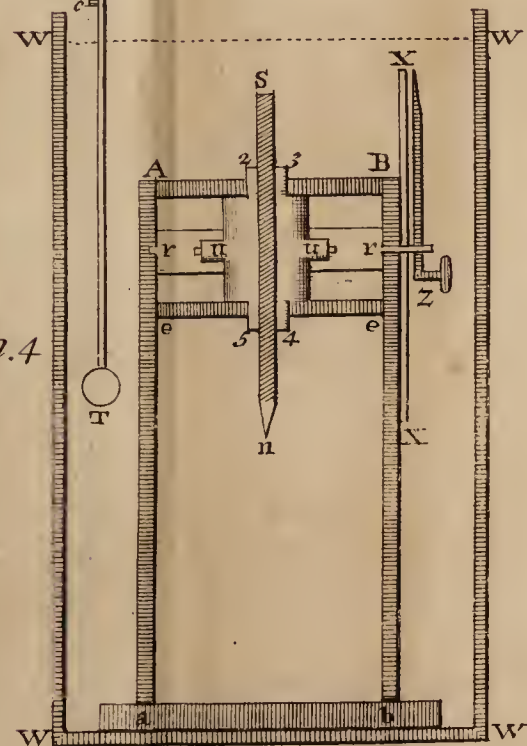


Fig. 3

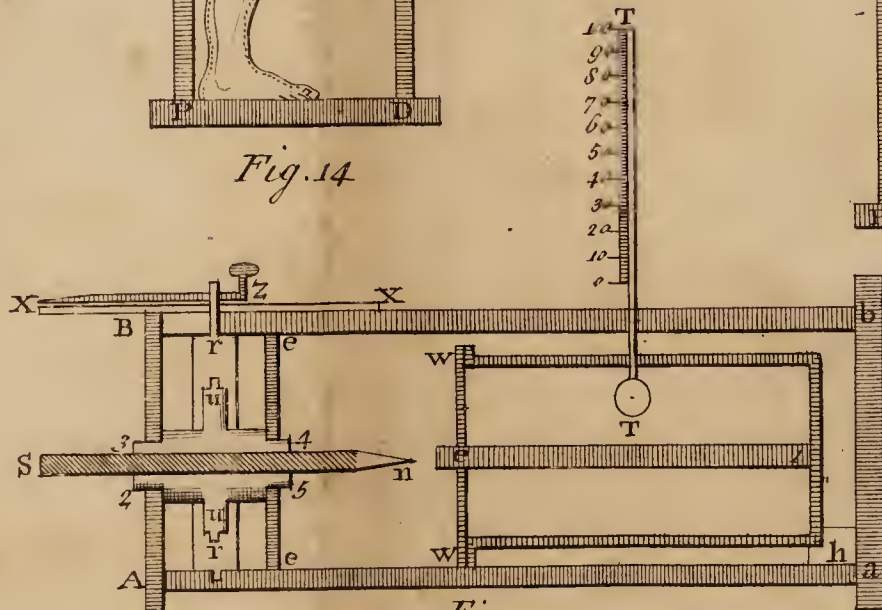


Fig. 7



Fig. 11

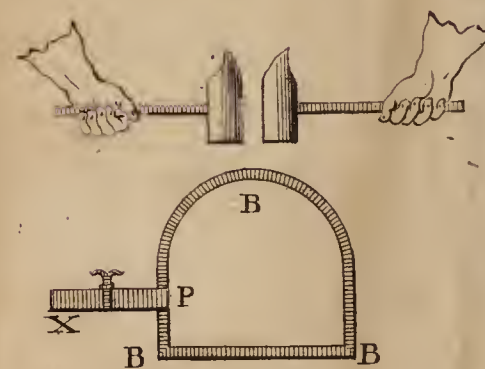


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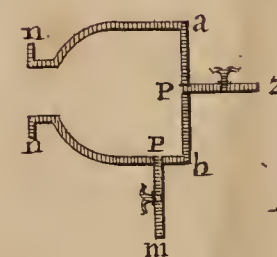


Fig. 16

Fig. 1

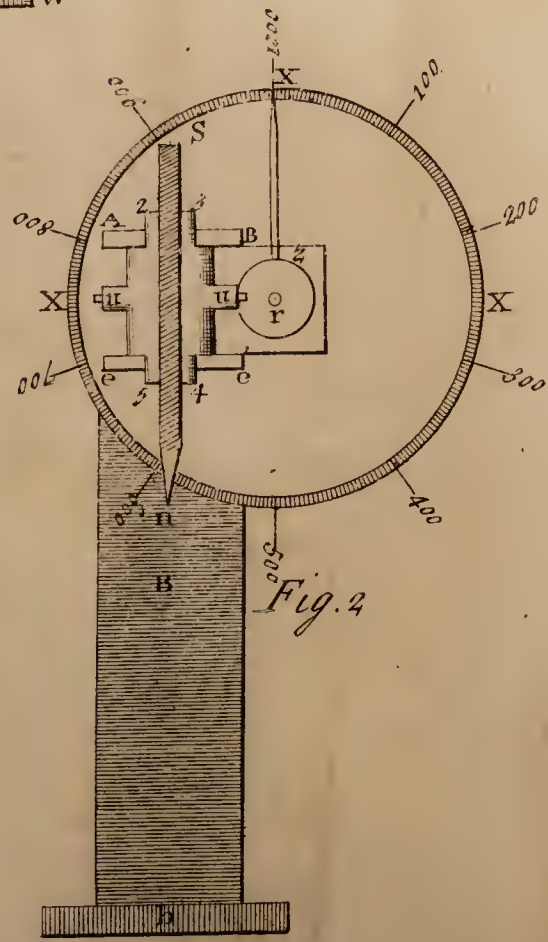
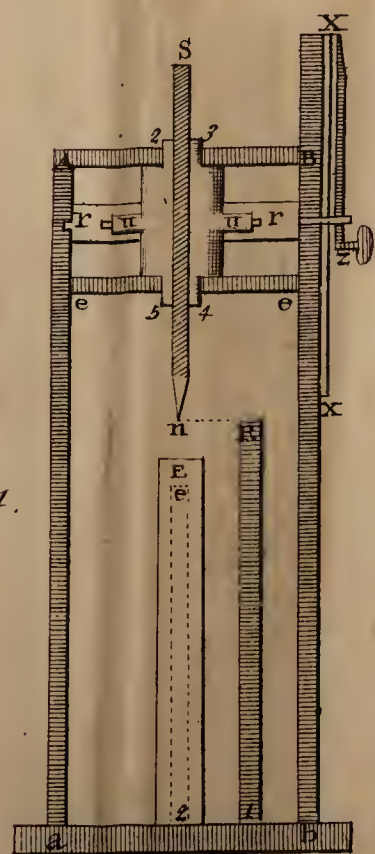


Fig. 2

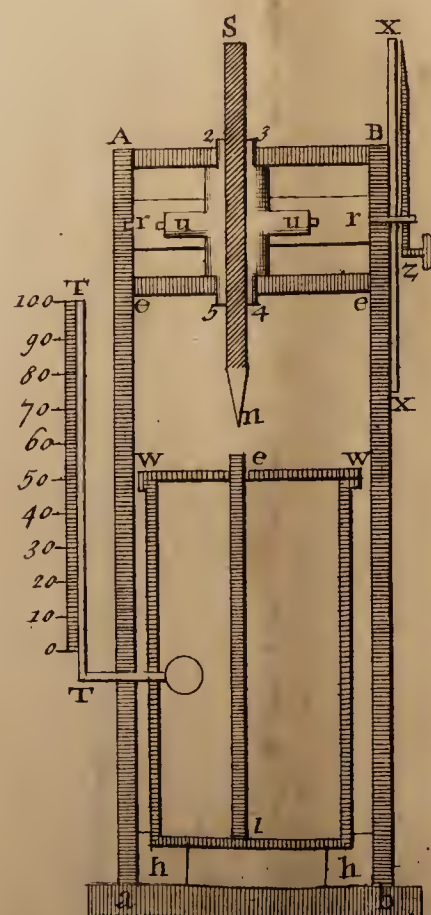


Fig. 6

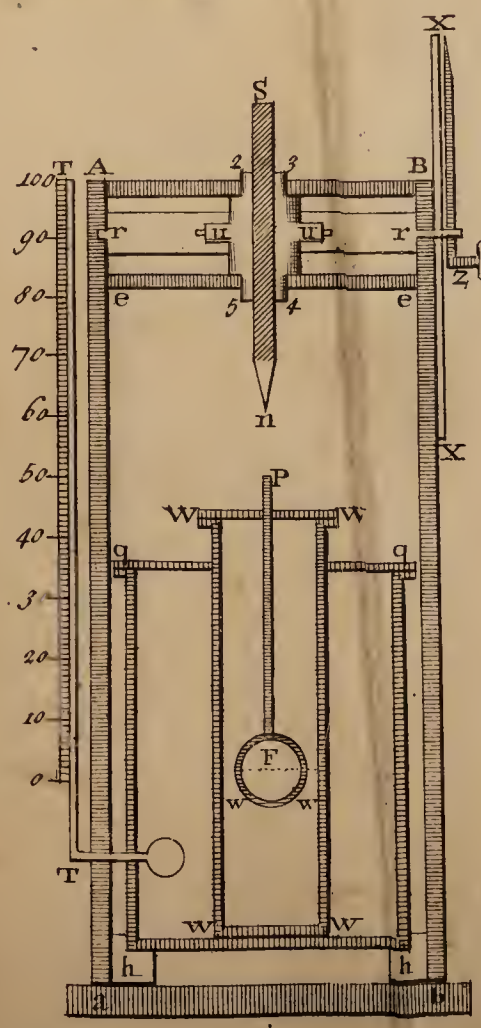


Fig. 9



Fig. 10

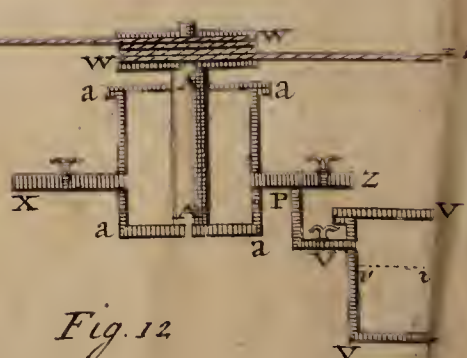
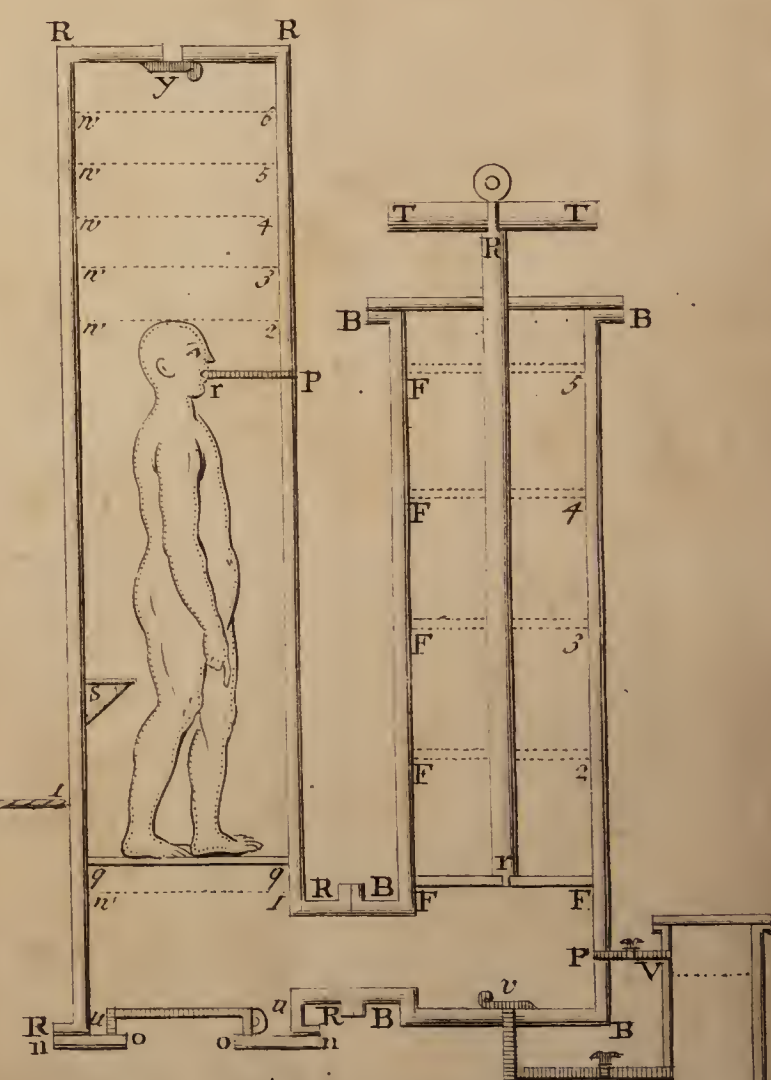
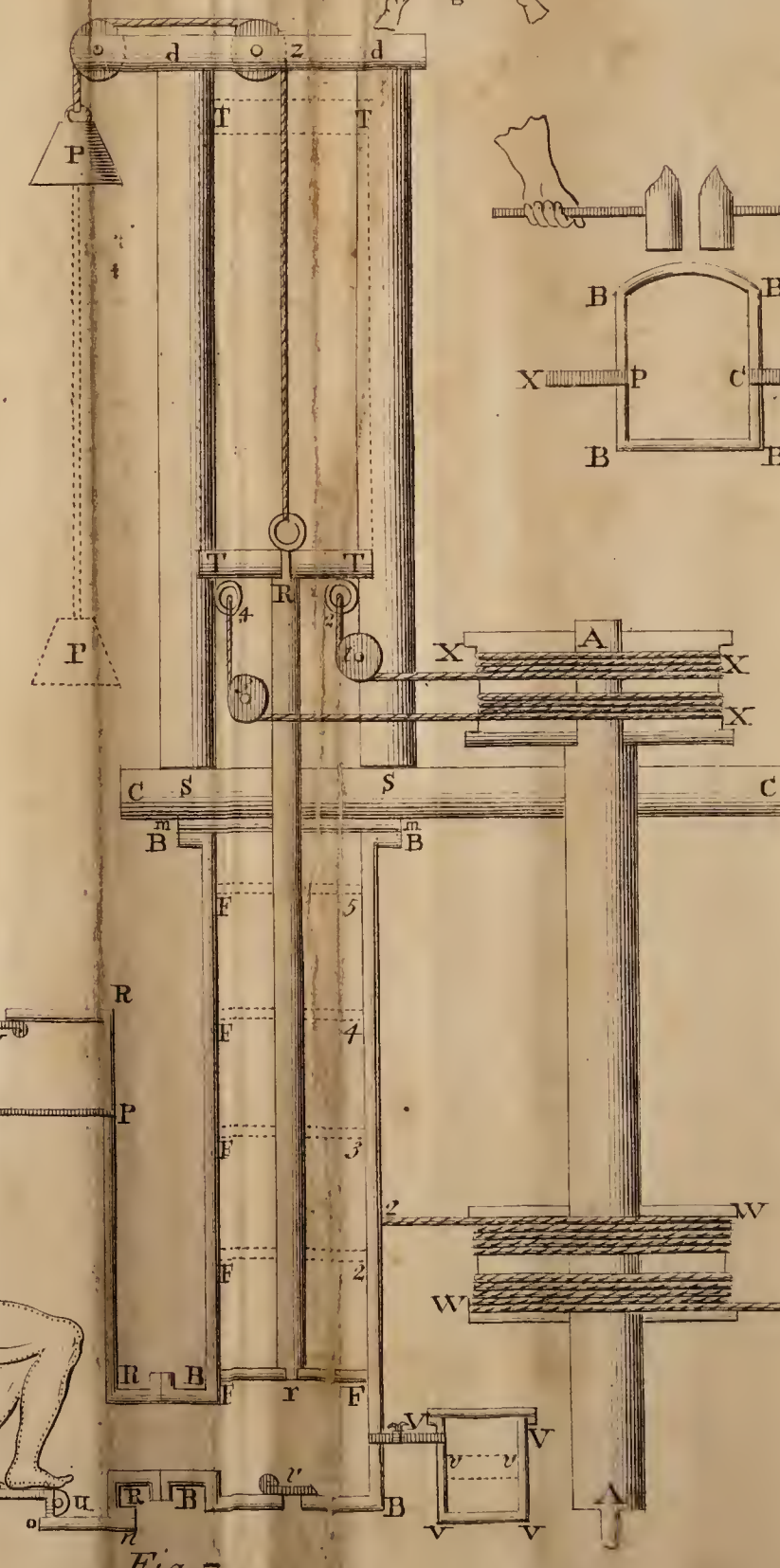
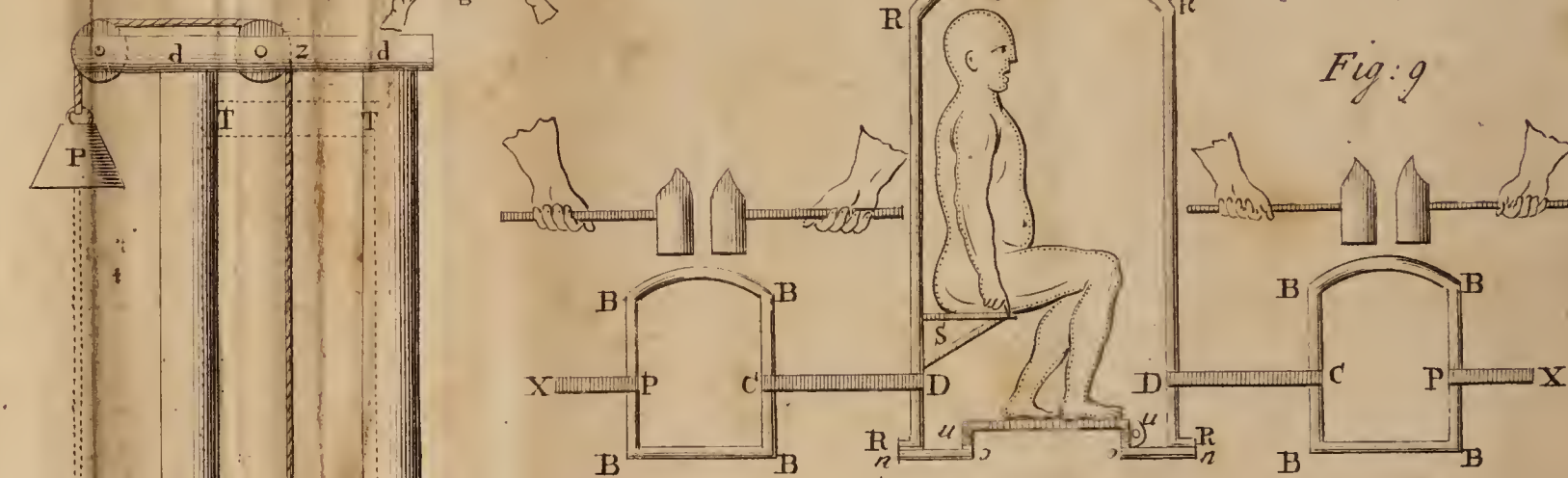
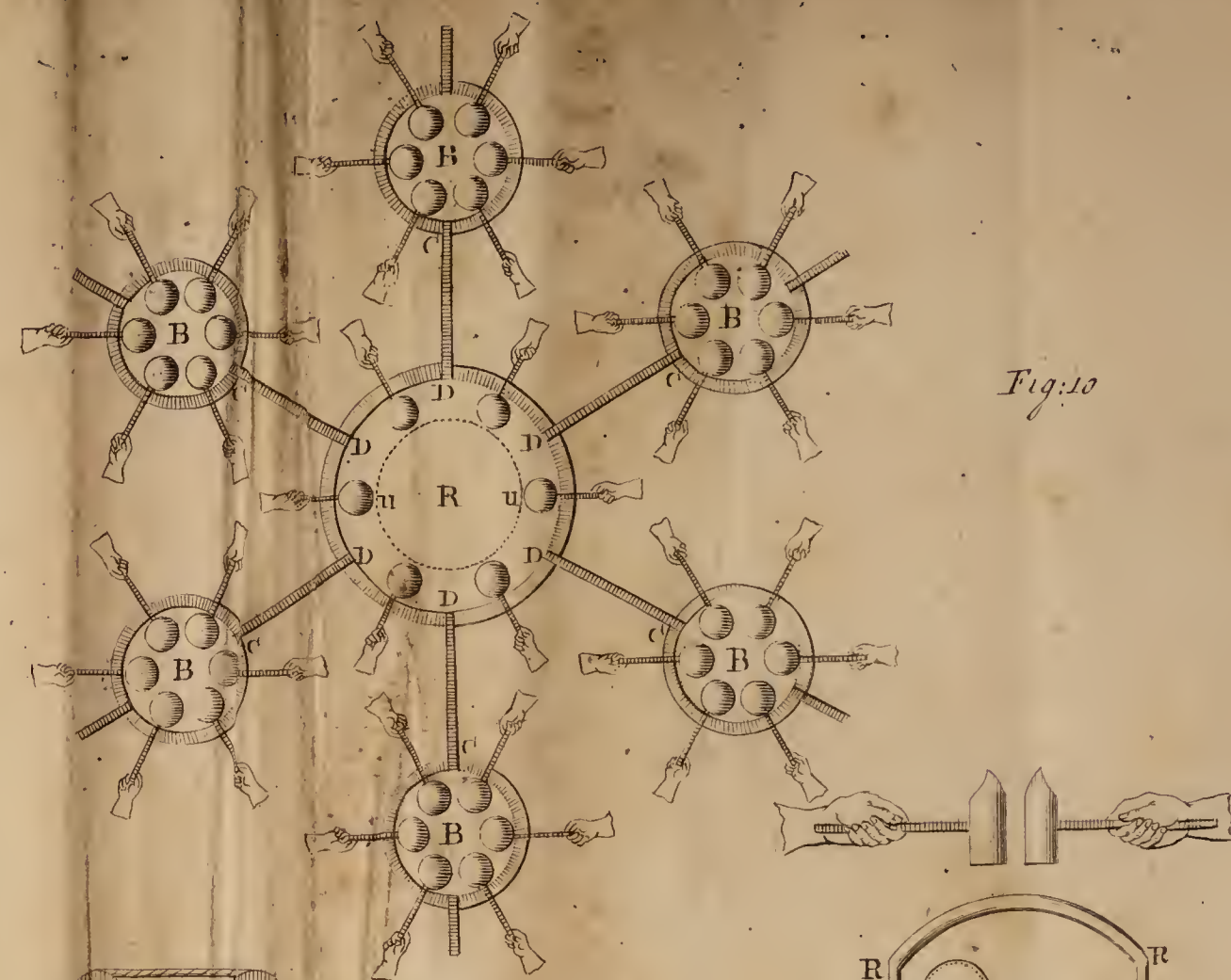
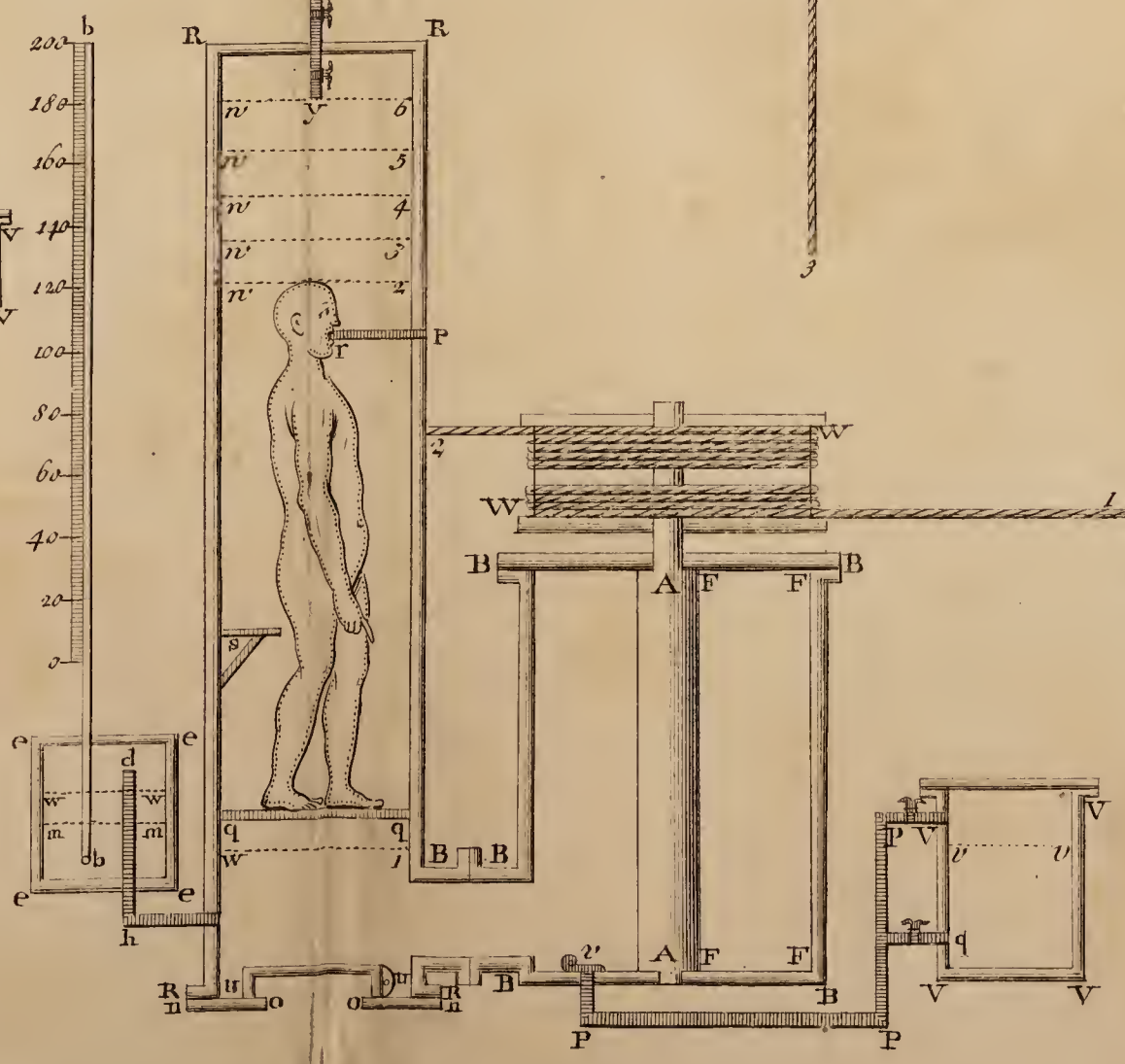
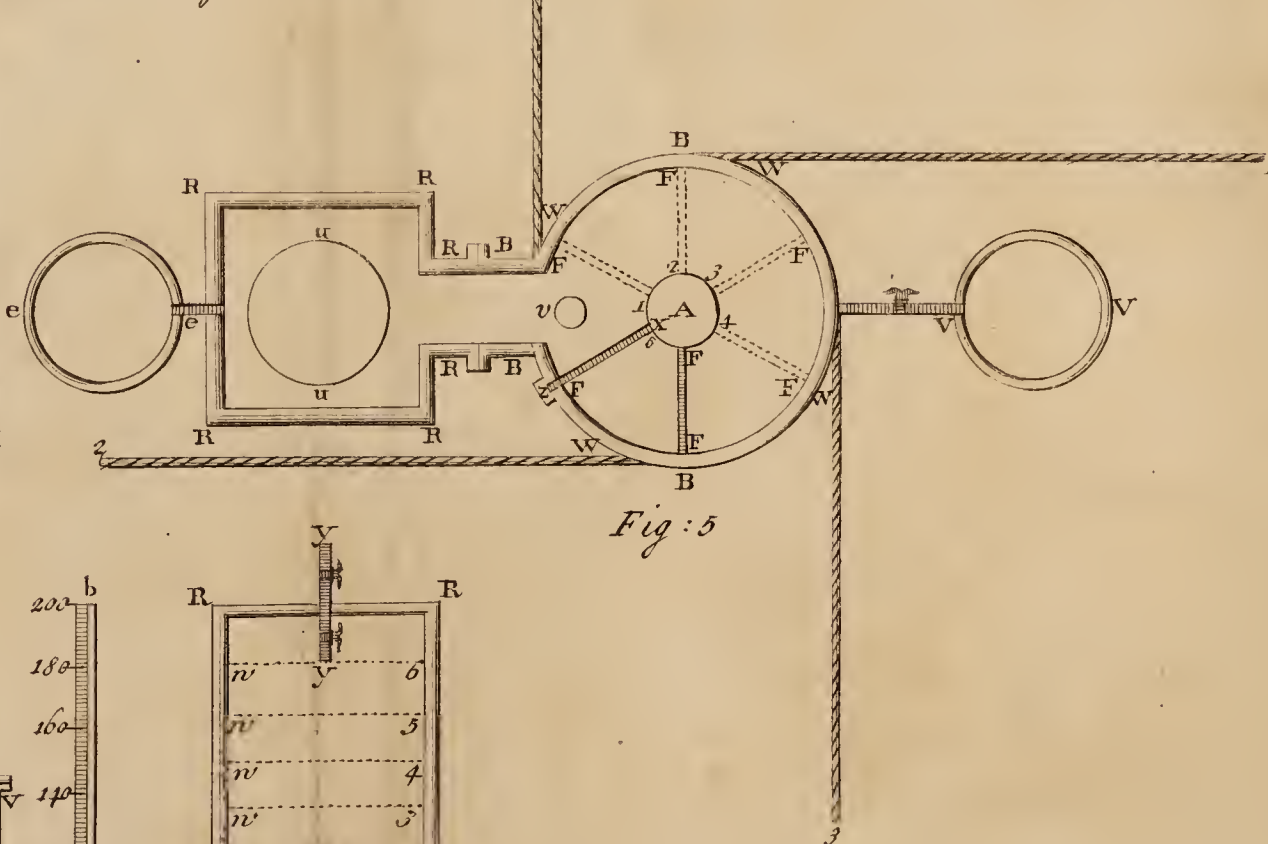
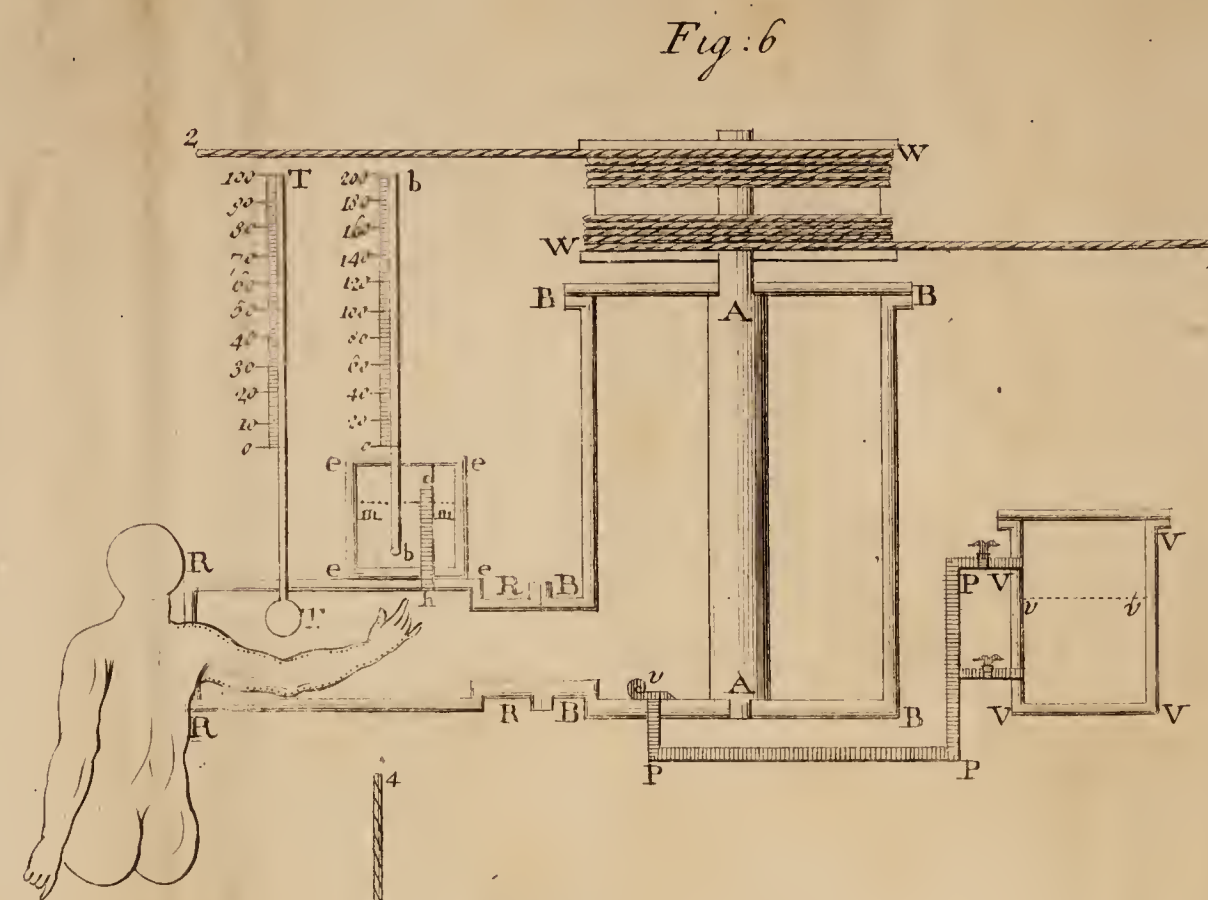
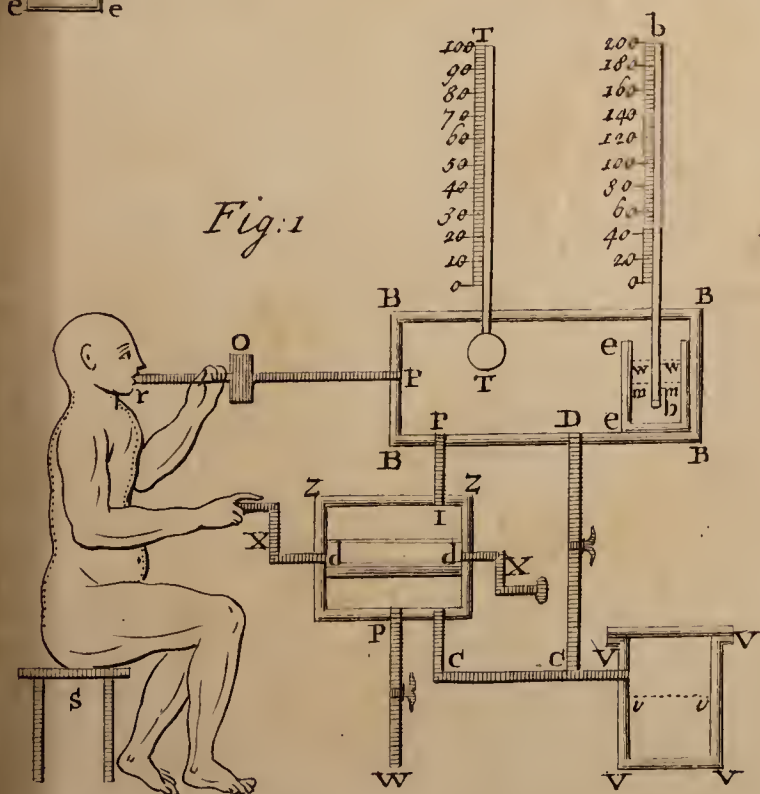
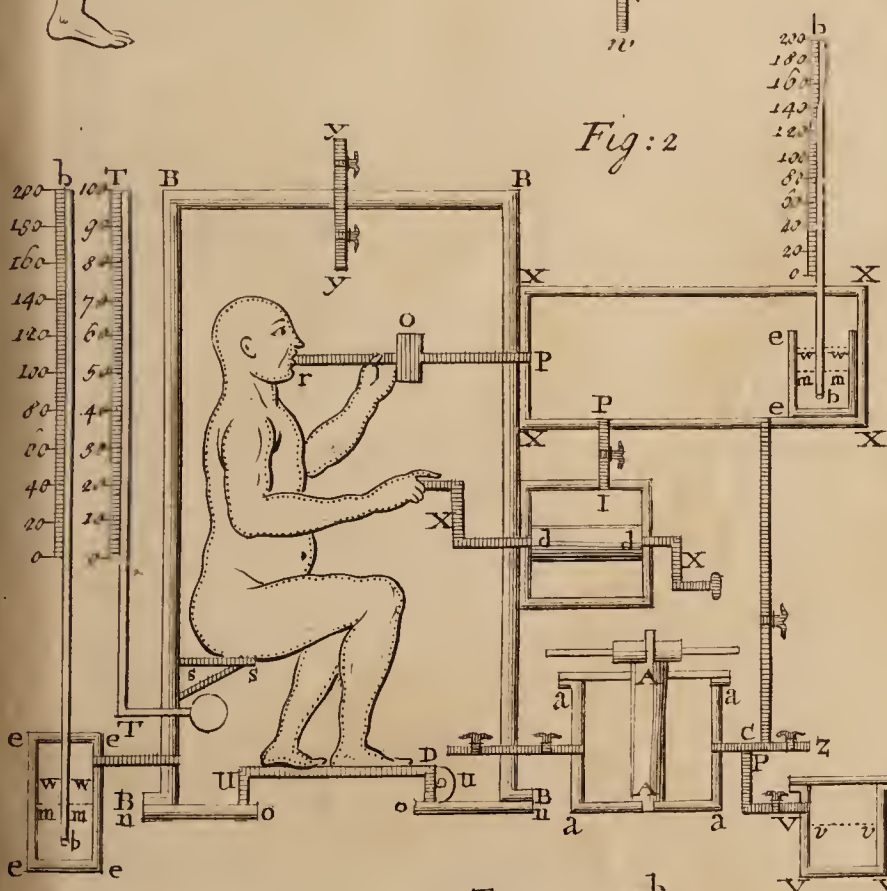
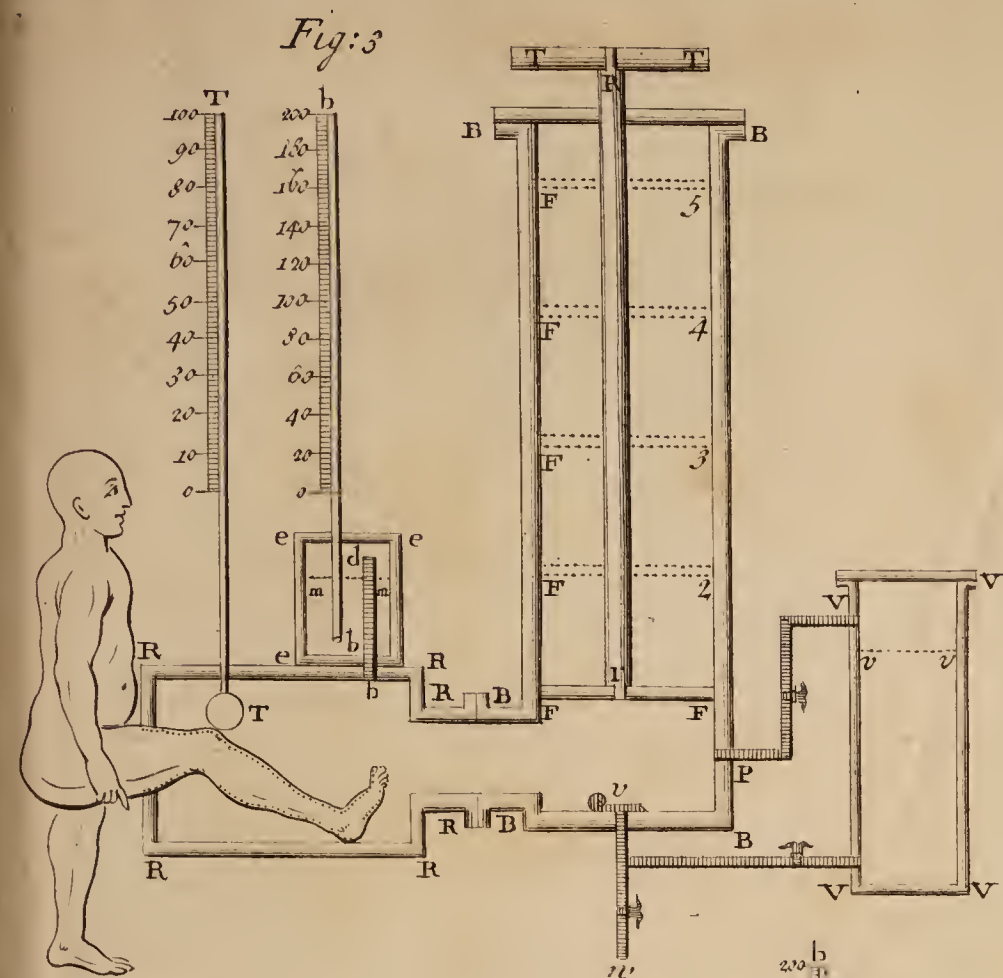


Fig. 12



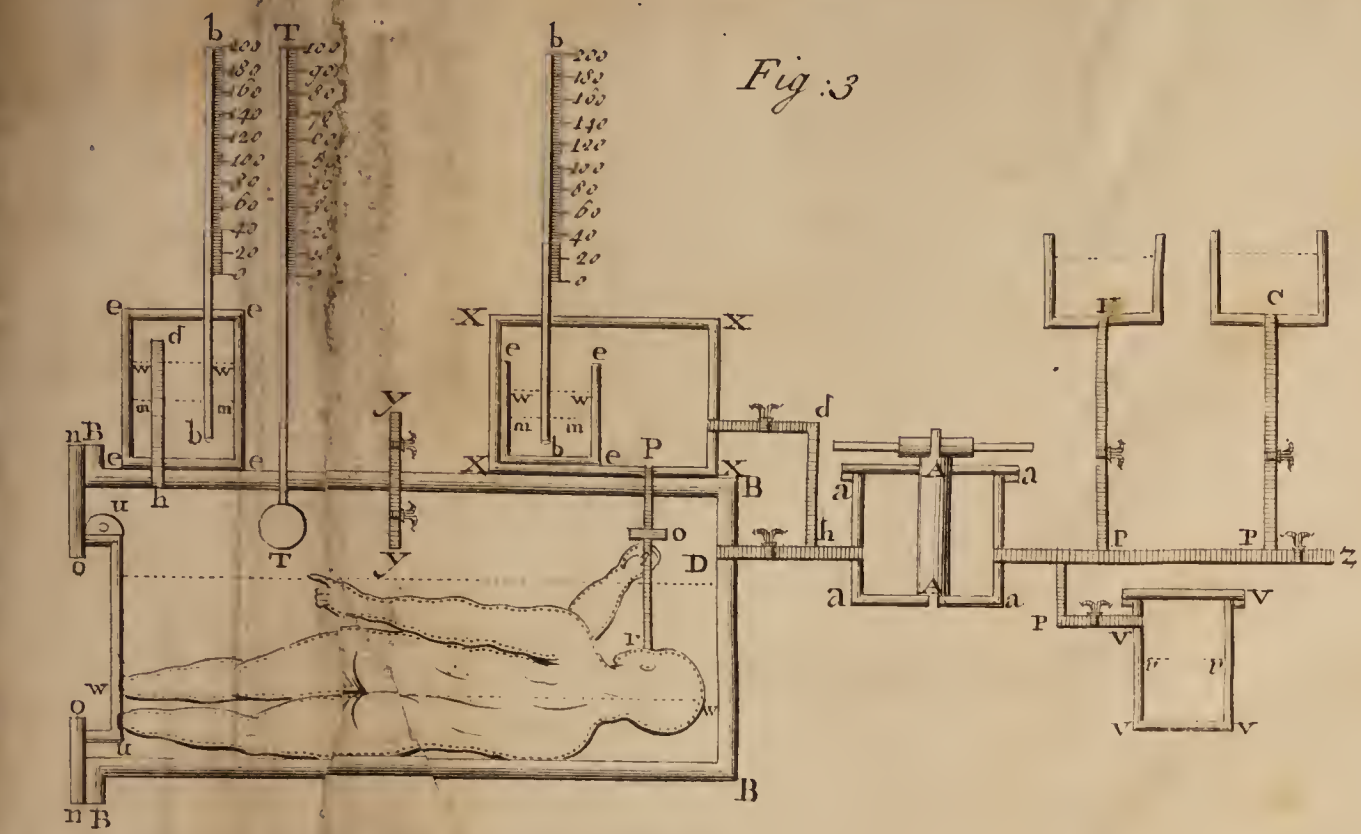


Fig. 3

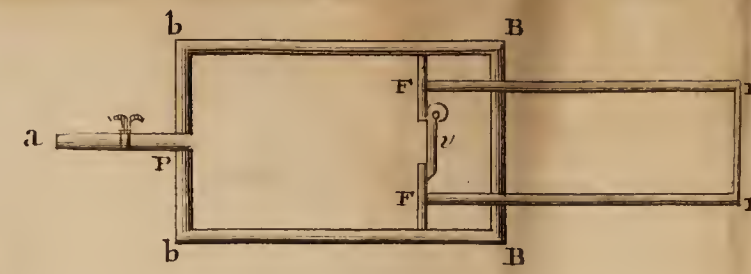


Fig. 10

Fig. 8

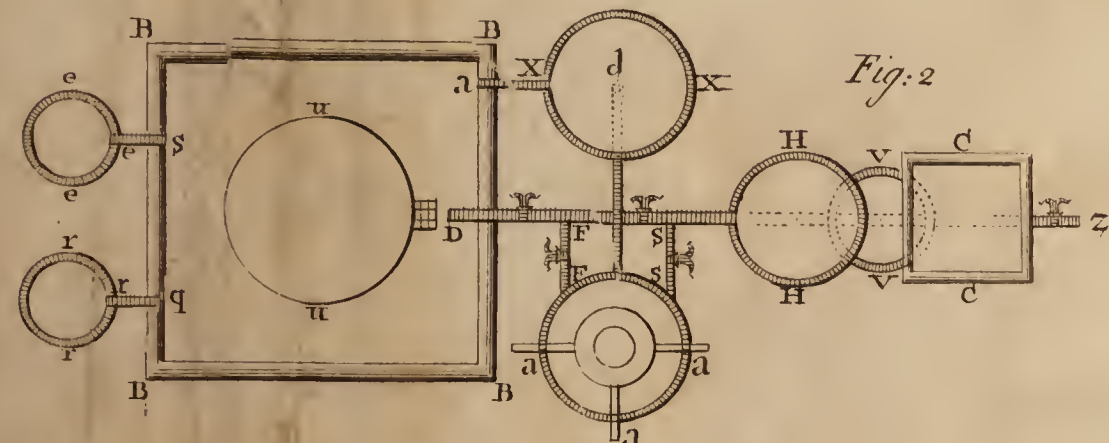
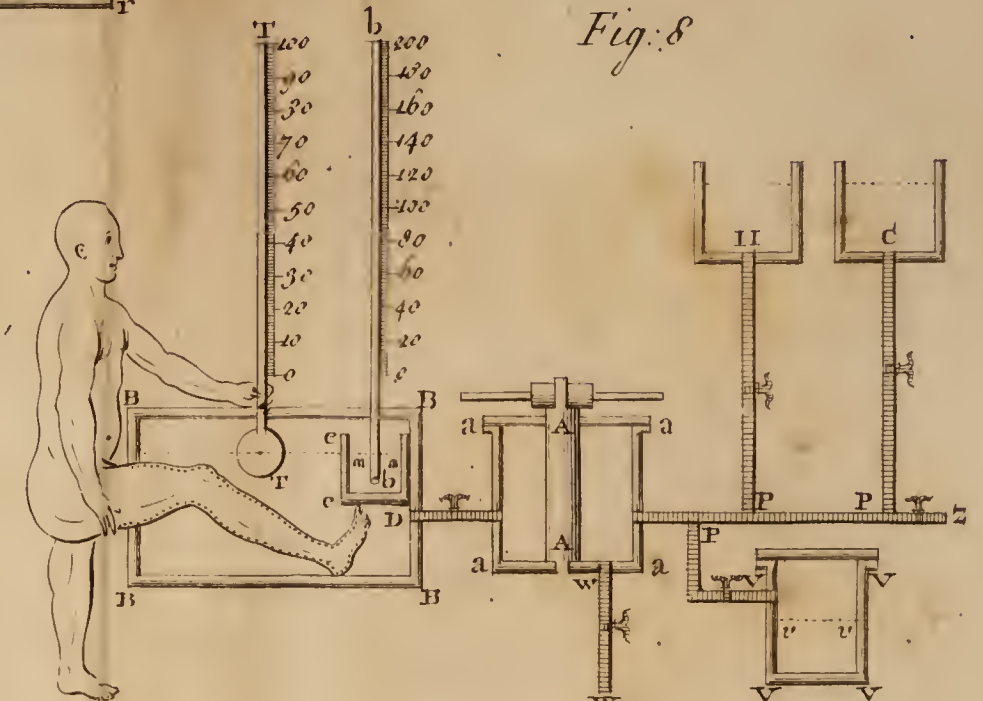


Fig. 2

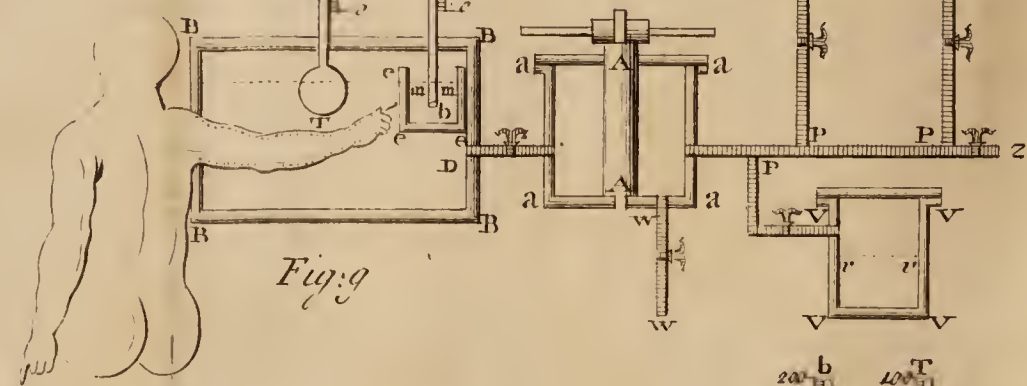


Fig. 9

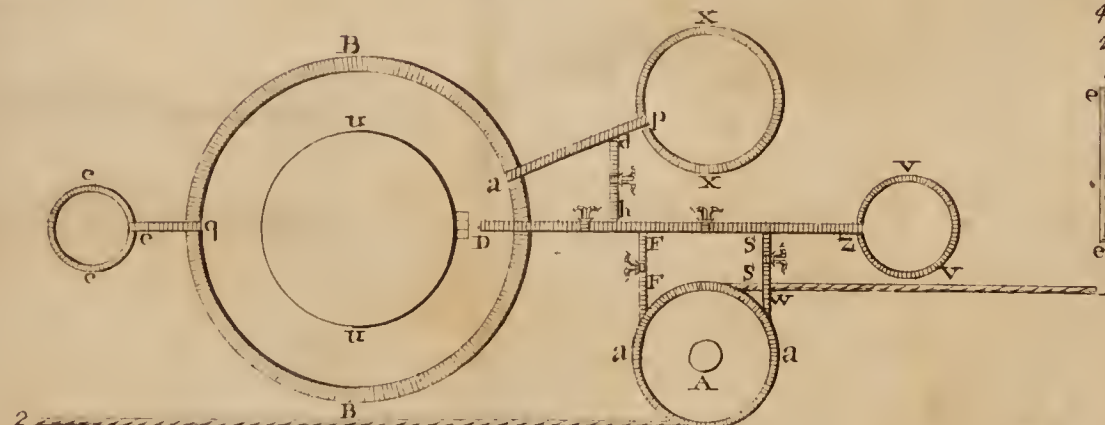


Fig. 5

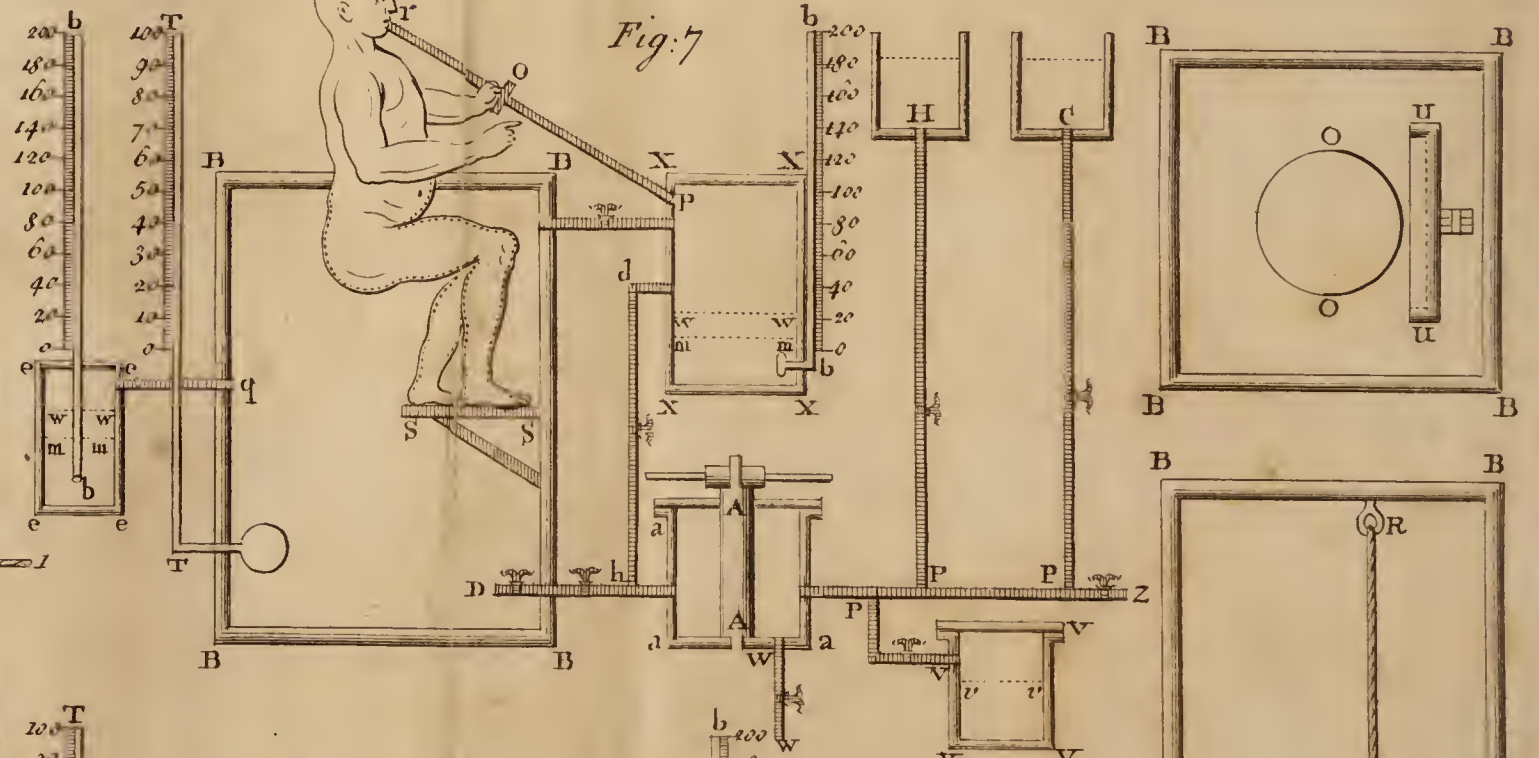


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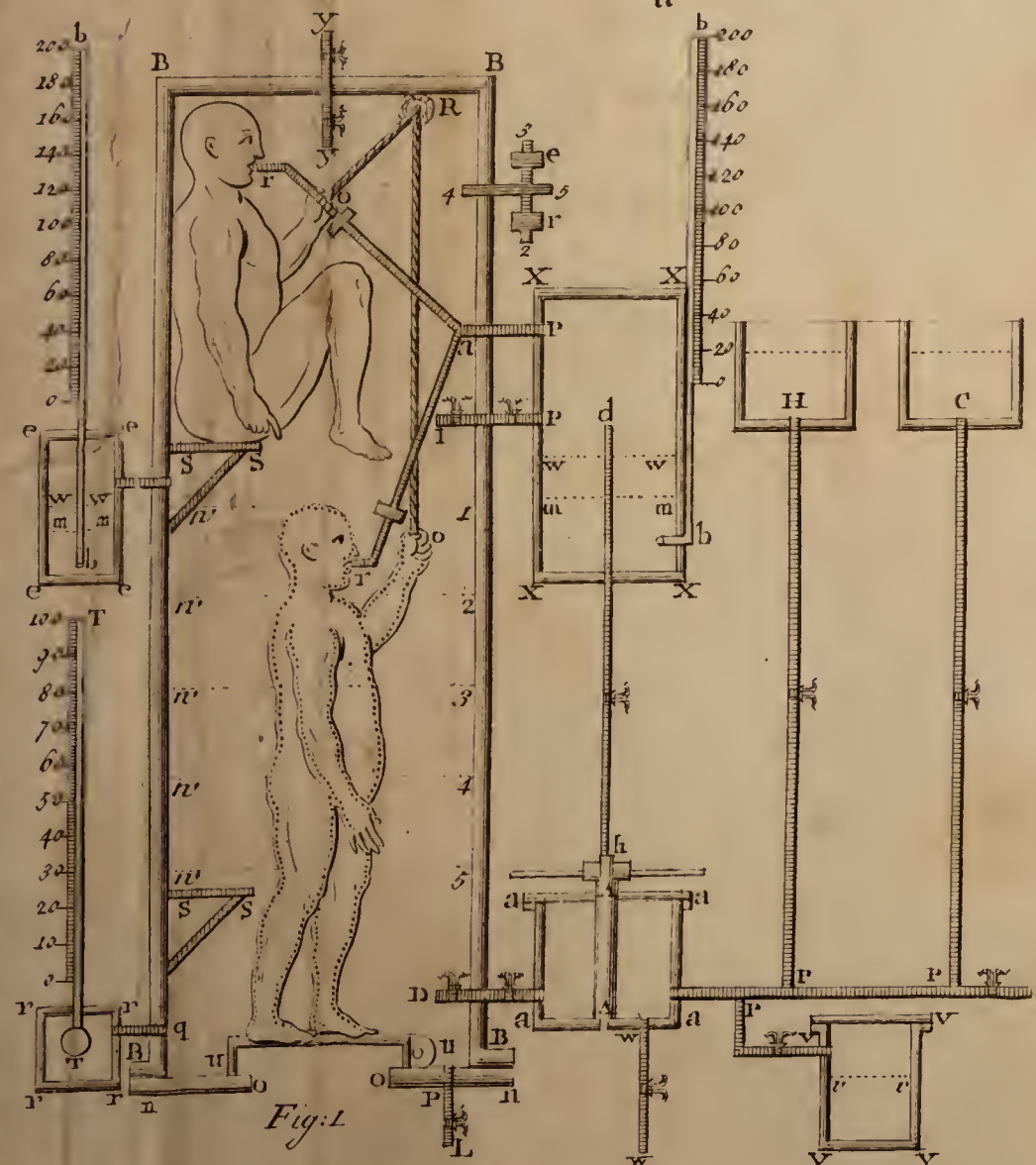


Fig. 1

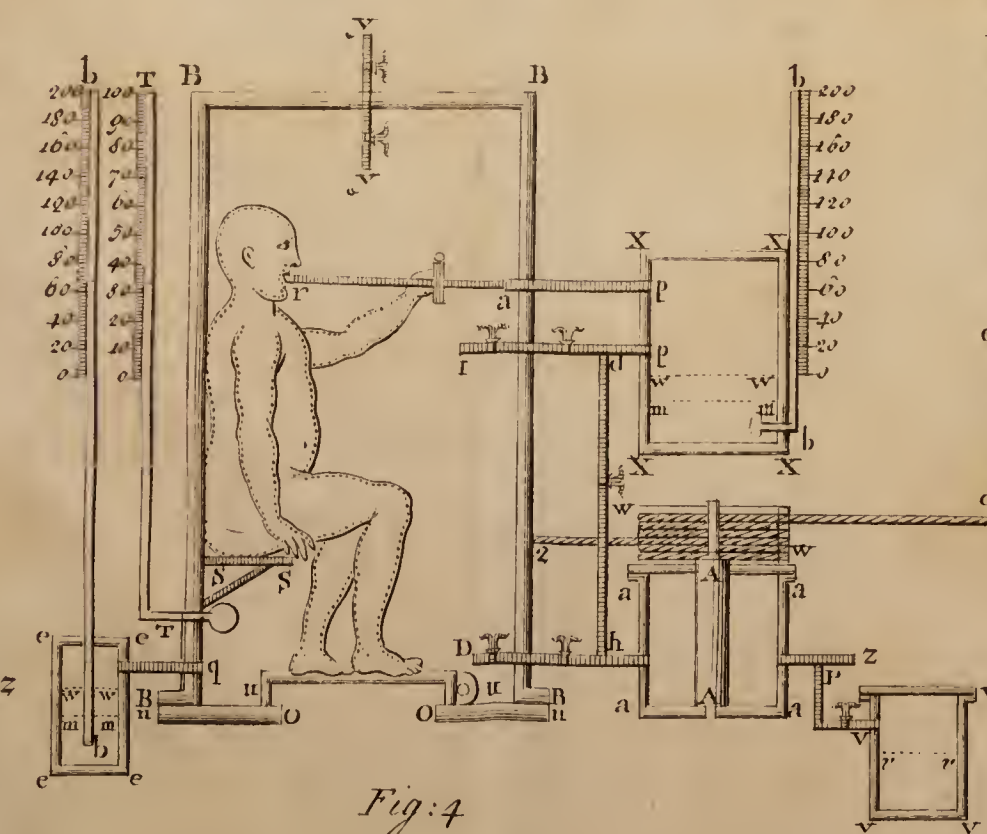


Fig. 4

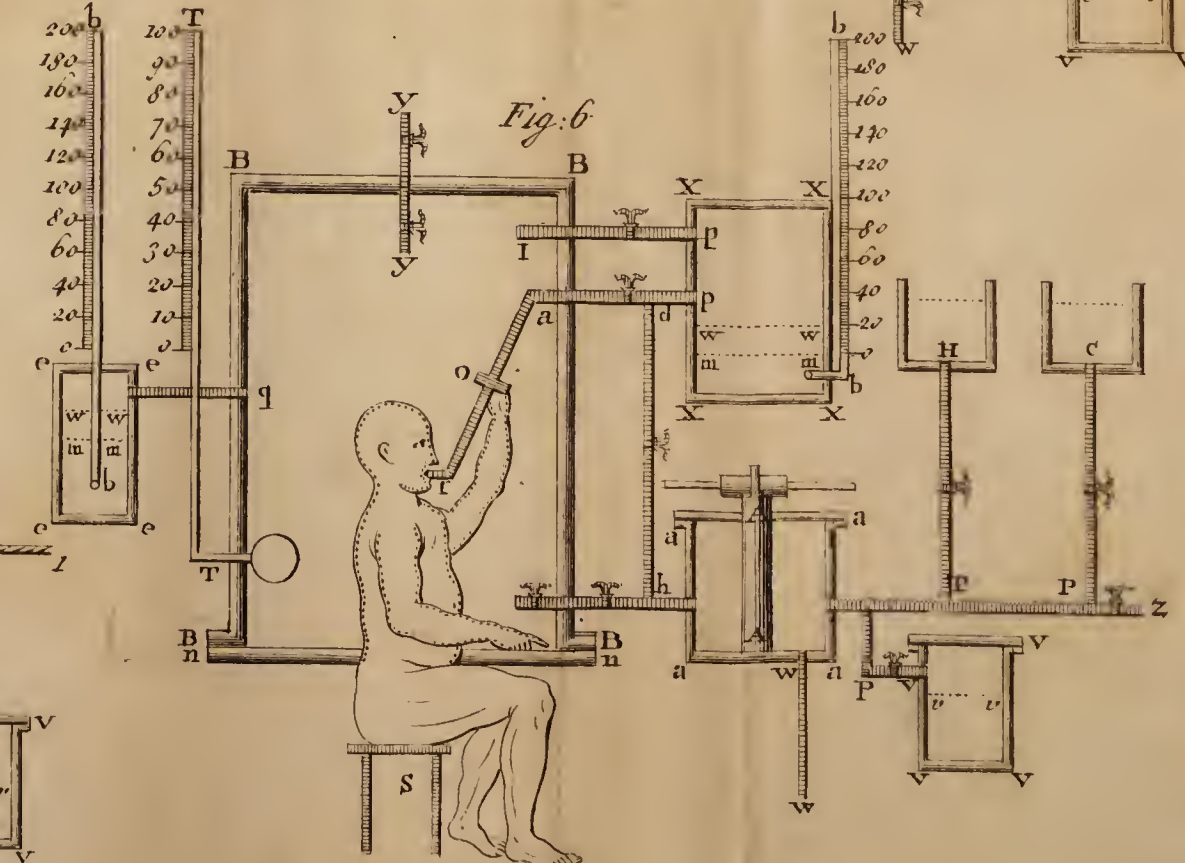


Fig. 6



Fig. 11

